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General H.R.H. THE COMMANDER-IN-CHIEF in the Chair.

THE MILITARY CHARACTER OF GENERAL SIR CHARLES J. NAPIER, G.C.B.

By Col. MACDOUGALL, Commandant, Staff College.

THE life of Sir Charles James Napier, which forms the subject of this address, was so full of strange perils and marvellous escapes, so illustrated by greatness of soul and greatness of action, that it would almost seem more properly to belong to the age of romance; and I must bespeak the indulgence of my hearers on account of the inability I feel to do justice to a subject of so much interest in the limited time at my command.

Truly is it said of Sir C. Napier by his biographer, that "His is the story of a man who never tarnished his reputation by a shameful deed; of one who subdued distant nations by his valour, and then governed them so wisely, that English rule was reverenced and loved where before it had been feared and execrated."

It will be my endeavour in this address to show, imperfectly it must be, that in these words there is no exaggeration.

Passing over his childhood and youth, which yet abound in strangely interesting incidents, it was not till he was a Major in the 50th, which regiment he commanded in the action, that he first saw war in earnest at

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Corunna. I do not believe there exists a more graphic description of exciting and terrible events, than the record he has left of his personal share in that battle.

I can only regret that time does not admit of my reading the narrative as set down in his journal, for, although desperately wounded—his ankle broken by a bullet—stabbed in the back—and engaged in a struggle for his life against numerous enemies, during which he received another severe wound from a sabre cut on his bare head—he was yet able to observe and to record the minute events of the day with a simplicity, a force, and a self-evident accuracy, which under the circumstances are truly astonishing.

Made prisoner at Corunna and released by the generosity of Marshal Soult, for which good deed the whole Napier family during their lives cherished towards the Marshal the warmest gratitude,—Major Napier was present as a volunteer at the action of the "Coa," and, with very unaccustomed good fortune, escaped on that occasion unwounded. His remarks, made at the time, on Craufurd's errors, are well worthy of study, and show to what an extent he had already mastered his profession.

At Busaco, again a volunteer, he received a terrible wound, from the effects of which he suffered tortures during the remainder of his life; a bullet having passed through his nose, broken the left jaw, and lodged near the ear. The operation for the extraction of the ball was frightful, which however he treated as lightly, according to the testimony of his cousin who was present, as the drawing of a tooth. When it was over, he was with difficulty prevented by Sir E. Pakenham from rushing back into the fight, with his jaw broken, and blood flowing from his mouth.

His two brothers, George and William, were in the battle and had heard of his wound; but sent him word that they could not come to see him.

"How proud and happy," he says in his journal, "this message made me. I gloried in them; yet, thinking I could not live long, I was very anxious to see them, especially as I heard George had been wounded while gallantly leading a charge. William had been shot through the hip two months before, but did not go to the rear, and went into action here with the wound still open. Well, we are all three still alive, and old men: we were then young, strong, and as hardy men as any in the army, and we had fifteen or sixteen wounds between us, and being very fond of each other it made a talk among our comrades."

Again we find Major Napier with his wound still bandaged, riding ninety miles in one day to join his regiment, forming part of the force with which Wellington pursued Massena. His two brothers were in the Light Division which led the advance, and which was almost hourly engaged with the French rear-guard under Ney.

Thus advancing, he met on one occasion a litter of branches being carried to the rear; on asking the bearers what wounded officer they carried, the reply he received was "Captain Napier, 52nd, with a broken limb." A second litter followed, and he was told that its occupant was Captain Napier, 43rd, "mortally wounded," as it was supposed at the time. He only looked at them and passed on to the fight in front.

At the conclusion of the war Charles, then Lieutenant-Colonel Napier, entered the Military College at Farnham. His brother William was there at the same time. The motives which induced these men, who had served

with so much distinction in the field, to shut themselves up for two years within the walls of a college, are well set forth in a letter of advice which thirty years later the Governor of Scinde addressed to a young officer :—

" By reading, you will be distinguished ; without it abilities are of little use. A man may talk and write : but he cannot learn his profession without constant study to prepare, especially for the higher ranks, because he there wants the knowledge and experience of others improved by his own. But when in a post of responsibility he has no time to read ; and if he comes to such a post with an empty skull, it is then too late to fill it, and he makes no figure.

" Thus many people fail to distinguish themselves, and say they are unfortunate, which is untrue. Their own previous idleness unfitted them to profit by fortune."

In 1822, Colonel Napier was appointed Military Resident at Cephalonia, which gave him despotic power over the island, as Lieutenant of the Lord High Commissioner. " Besides being King," he says, " I am bishop also, and all the convents and churches are under me ; the priests cannot kill a fowl without my written order." The work was excessive. " My predecessor," he wrote, " is going home half dead from the labour ; but to me, it is health, spirit—everything. I live for some use now. I take no rest myself, and give nobody else any." Indeed, his labours for the improvement of the Cephalonians were as incessant and as successful, as they were afterwards, on a larger scale, for the regeneration of Scinde. They were cut short in 1830, in consequence of a disagreement with the Lord High Commissioner; but the best testimony to the beneficence of his rule is to be found in the fact, that after he had quitted Cephalonia for ever apparently in disgrace with the Supreme Governor, the peasants of that island voluntarily cultivated a small piece of land, left by him uncared for, and transmitted to him yearly the value of the produce.

I shall have to relate a parallel instance which occurred twenty years later, when he was quitting India for the last time at enmity with the Indian Government.

In 1839, Major-General Sir Charles Napier was selected for the command of the Northern district, at the time when the Chartist agitation was at its highest and an outbreak seemed imminent ; and the details of his proceedings in this anxious post—his sagacity—his forbearance—the tact with which he reassured the over-timid, and restrained the over-violent—are full of interest and instruction.

During his Northern command Sir C. Napier's health began to give way. He fancied himself threatened with blindness, and complains occasionally in his journal of the unendurable agonies he suffered—the consequence of his Busaco wound. He evidently believed that he was failing—that his work was well nigh done—and that his character and ability must be judged by the deeds of his past life. He little thought that the most brilliant part of his career lay in the future—that opportunity would yet be afforded him to prove that his ability both for war and for government were of the very highest order ; and that he only wanted equal opportunities to become the rival in renown, as I verily believe him to have been the equal in genius, of the greatest captains of the world.

It is strange to observe how late in life the great work to which they seem

born comes to some men. Appointed Major-General on the Bombay staff in 1842, Sir C. Napier was sixty-two when his selection by Lord Ellenborough for Scinde first gave him an independent military command.

Scinde was at this time still heaving with the swell occasioned by the Cabool disaster, and agitated with hatred to British authority.

I am not here to consider the justice or policy of the conquest of Scinde. That conquest was effected by Sir C. Napier as an executive officer in the unquestioned discharge of his duty, with a rapidity, a completeness, and a clemency, almost unparalleled in history, and whose effects have been as enduring as they have been beneficial to the conquered race.

It seems to have been Sir C. Napier's destiny to be placed continually amid scenes of terror and suffering, and to experience marvellous escapes from deadly peril. No sooner did the steamer, in which he now embarked at Bombay for Kurrachee, gain the open sea, than cholera broke out on board in its most frightful form.

In the six "bitter days and nights," as he calls them in his journal, during which the voyage lasted, fifty-four dead bodies were cast into the sea, just one-fourth of the whole living freight; eighty more were seized, of whom ten died after landing. To crown all, the steamer nearly went ashore on a dark night, when making the land, owing to the drunkenness of the two mates.

Escaped from these dangers, the ill-timed explosion of a rocket, four days after he landed, tore the calf of his leg open to the bone and inflicted what might have been a very dangerous injury; but the wound healed, as doctors say, "by the first intention," owing probably to his remarkable temperance both in eating and drinking, and five days afterwards he was travelling towards Hydrabad.

Scinde was at this time in a very disturbed political state. It was inhabited by three distinct races, Beloochees, Hindoos, and Scindians proper. The Ameers, princes of the land, were chieftains over the Beloochees, tyrants over the other two.

A treaty, concluded by Lord Auckland three years before, gave to the British control as a paramount power over the Ameers, and the right of military occupation of certain places in Scinde; but when Sir C. Napier arrived, the Ameers, encouraged by the recent Cabool disaster, were exciting the mountain tribes to war and preparing for it themselves.

It was precisely at the time when, to re-establish British prestige, General Nott advanced from Candahar to join General Pollock at Cabool, with orders afterwards to retire to India by the Khyber pass, while Colonel England with a part of Nott's force fell back into Scinde by the Bolan pass. While the troops were thus dispersed, the safety of England's column, and British supremacy in Scinde, evidently depended on the capacity of Sir C. Napier as a politician and a commander.

The places occupied by the British under the treaty, were Sukkur, Roree, Shikapore, and Kurrachee.

The possession of Sukkur and Roree afforded a secure passage of the Indus from either bank, and was of great strategical importance; not only because it enabled the General to operate by either bank of the river at will, but because those places constituted a base of operations for the British force, which could thence communicate with the British North-west pro-

vinces and the Bengal army, through the friendly territory of the ruler of Bhawulpore.

When Sir C. Napier assumed the command, the force in Scinde did not exceed 4,000 men, and was about equally divided between Sukkur and Kurrachee ; that is to say, 400 miles asunder, with insecure communication. The remainder of the troops intended to form his army were with Colonel England, approaching Sukkur by the Bolan pass ; when these joined, as they did shortly after, his force amounted to about 9,000 men of all arms.

All the Ameers both of Upper and Lower Scinde, with the exception of Ali Moorad, had entered into a league against the British ; but it was their great object to postpone a rupture for two reasons.

1st. To gain time for the assembly of their troops ; and they could bring together, if time were given them, between 70,000 and 80,000 men.

2nd. To defer military operations to the approaching hot season, when the sun would prove their most powerful ally.

Every artifice was therefore employed to deceive the English General as to their intentions.

Sir C. Napier was thought fortunate in having, at this crisis, the assistance of an experienced Indian officer as political agent, who had spent his life in unravelling the threads of Indian intrigue, and was generally supposed to be a master of the art.

But repeated infractions of the treaty by the Ameers, and the certain information that they were secretly assembling their troops, convinced Sir C. Napier, although these facts failed to convince Major Outram, the political agent referred to, that those princes only waited their opportunity to attack him. He wrote this opinion to Lord Ellenborough as early as the 30th November, and on the 26th December, before his enemies' plans were ripe, he took advantage of a fresh violation of the treaty to march suddenly on Khypore, the capital of Upper Scinde, with 3,000 men and 18 guns.

Dismayed by this act of vigour, the Ameers of Upper Scinde went off to join their friends in the south with their fighting men, their families, and their treasures.

Thus Upper Scinde was cleared of enemies, but the task which remained to the English General was by no means easy. It was now the beginning of January. The hot season began in March, after which military operations was only another term for death to European troops. Sir C. Napier's intelligence department, in the organization of which he has never been surpassed, gave him certain information that the Belooch tribes were mustering about Hydrabad ; and that place, which must be his object, was 150 miles distant. He had at his disposal in all Scinde only 9,000 men, of whom at least three-fourths were Sepoys. 3,000 was the largest number he could bring into the field, after providing for the garrisons of Sukkur, Roree, and Kurrachee, on account of the impossibility of procuring transport ; the dread of the Ameers being over the contractors, so much so that the principal contractor forfeited his deposit rather than incur their vengeance.

Sir C. Napier now learned that the Ameers had thrown a garrison of 2,000 men into Emaun-Ghur, a strong fort situated in the heart of the desert, on the flank of his line of march towards Hydrabad.

If he marched on Hydrabad, he would encounter the principal Belooch army supported on that fortress, and having Meerpore and Omercote, for-

tified places in the desert, to retire upon, while the troops from Emaum-Ghur, in all probability strongly reinforced by fresh tribes, acted on his rear and cut off all communication with Roree. And there was every reason to believe that if the Ameers gained an advantage however slight, the Affghans and Sikhs, who were watching the progress of events, would take part in the war.

Weighing all the chances, Sir C. Napier resolved to reduce Emaum-Ghur. This fort, armed and provisioned by the Ameers to serve as a base for the Belooch army of Upper Scinde, was supposed, from its position, inaccessible to European troops, and from its strength impregnable. Situated in the very heart of the waste, eight long marches from the edge of the desert, its exact position was unknown. The tracks by which the troops must move to reach it, and the wells on which their existence depended during the march, must be pointed out by native guides, and these men might be traitors. Several thousands of wild horsemen, too, hovered about the edge of the desert, able to fill up the wells or poison the water, and watching to fall on the fainting soldiers.

These were the difficulties. But both the moral and physical advantages of success promised to be so great that the General determined on the enterprise.

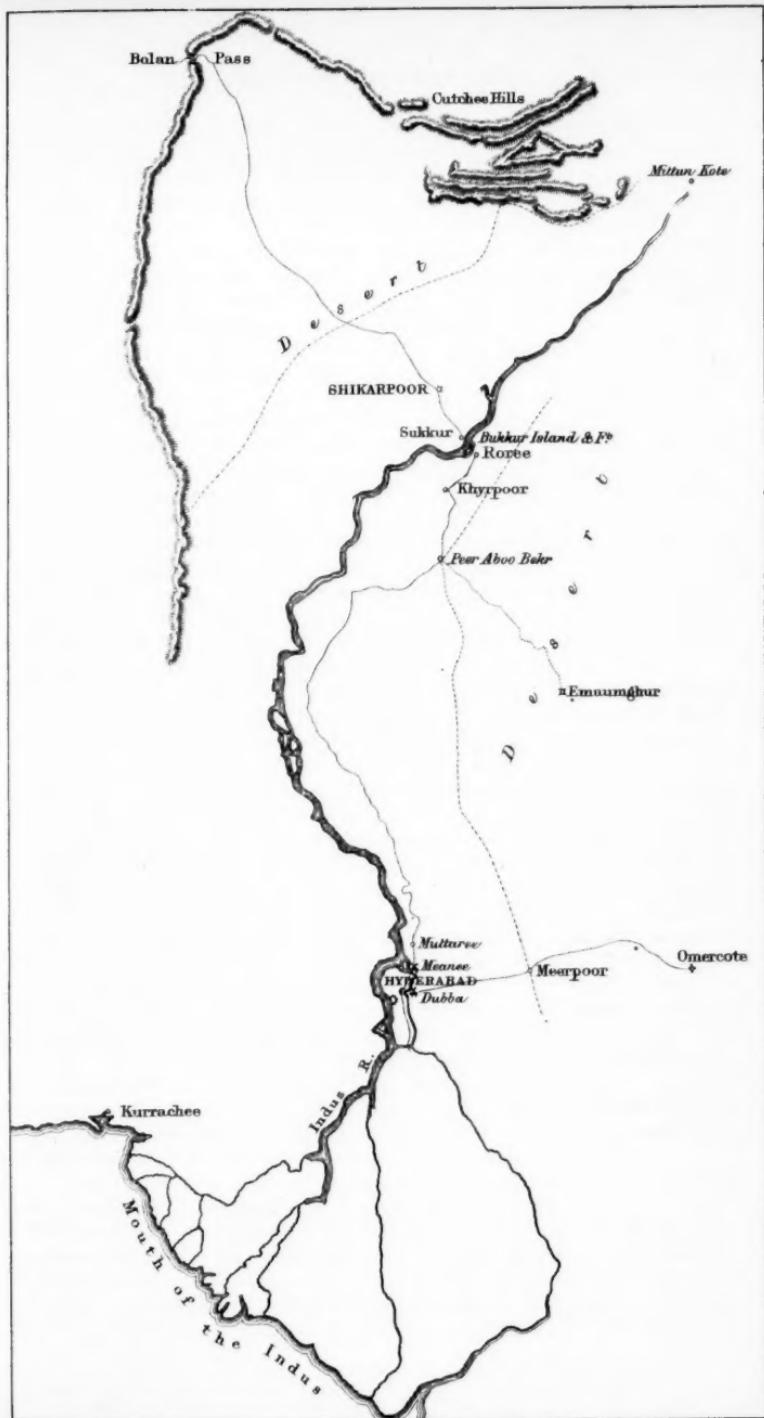
Reports of the depth of sand and scarcity of water along the route he must take having convinced him of the impossibility of operating with a large force, he selected 200 irregular cavalry, picked 350 of the hardest and most active men of the 22d regiment, and put them on camels, loaded ten camels with provisions, eighty with water—and with this handful of men and two breaching howitzers, he marched on the evening of the 5th January.

Next day forage failed, and water became scarce. He sent back three-fourths of his cavalry, retaining only fifty, and resolute to proceed so long as he could keep a hundred men together.

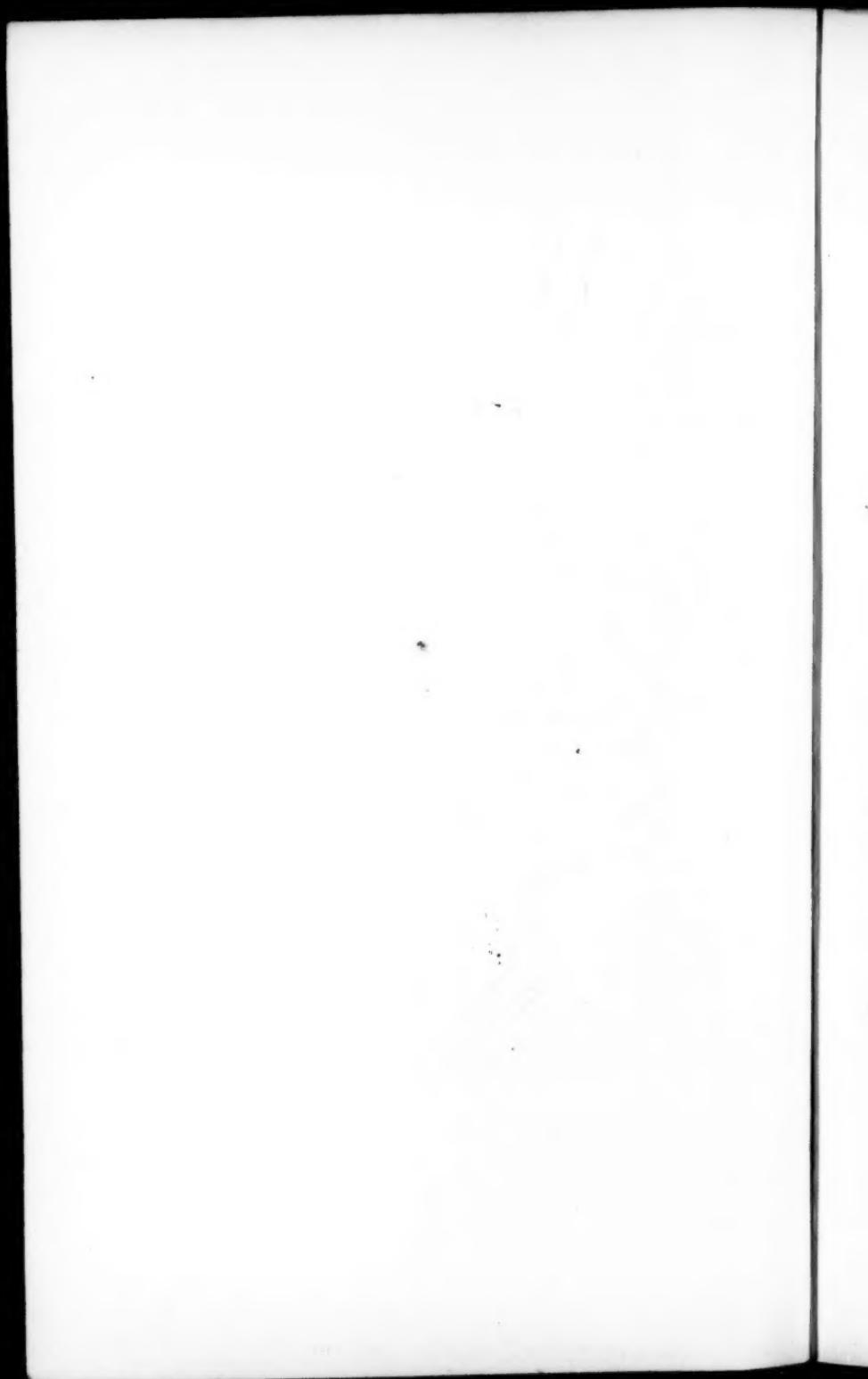
On the eighth day, having during their anxious march lived from hand to mouth, uncertain each morning whether water would be found in the evening—and several times it was not found—the little force reached Emaum-Ghur, where the justness of the General's calculations was at once apparent, for the Belooch commandant, with a strong fort well armed and provisioned, and having a garrison six times as numerous as the force moving against him, was yet so panic-struck by the audacity of the English general, that he had evacuated the place two days before, leaving all his stores of grain and powder behind him.

Sir C. Napier destroyed this fortress, retraced his steps through the desert, and joined his main body at Peer-Abu-Bekr, where it had been ordered to await him, on the 23rd January, without the loss of a man—without even a sick soldier—having completely effected his object, having destroyed once and for ever the confidence of his enemies in their desert as a protection, and baffled their plan of campaign.

It was now Sir C. Napier's business to persuade or to force the Ameers formally to sign a new treaty, which had been imposed upon them by Lord Ellenborough as a penalty for their repeated violation of the first, and which new treaty they had signified their readiness to accept with many protestations of loyalty.



J.R. Jobbins.



The Ameers temporised ; Sir C. Napier threatened to march against them instantly if they did not sign ; but deferred the execution of this threat at the urgent entreaty of Major Outram, who expressed the fullest confidence in the peaceful intentions of the Ameers, and in their submission to his demands.

But the hot season was drawing on, and it became necessary to put an end to all uncertainty. The 25th January was fixed as the last day for the signing of the treaty, and, that day having passed, the General marched towards Hyderabad.

His military position was now secure and commanding. His field force was about 3,000 strong, based on Sukkur and Roree, with a division of the Bengal army in reserve at Bhawulpore, forming a link between him and the British North-west provinces. His right rested on the Indus, on whose broad waters floated his armed steamers and supplies. His left rested on the desert, which was swept by Jacob with his Scinde horsemen, and where the enemy no longer possessed a strong place whence they might threaten his flank and his communications.

Sir C. Napier halted sixty miles north of Hyderabad, and, anxious to avoid bloodshed, he gave the Ameers to the 6th February to ratify the treaty. He even extended the time six days beyond that date, viz. to the 12th February, to enable Major Outram to proceed to Hyderabad to try the effect of his personal influence with the Ameers, which that officer was convinced would be successfully exerted.

Let me here pause in my narrative to recall the scene in the House of Commons, where a noble Lord opposed the vote of thanks to Sir C. Napier, on the ground that he had needlessly and wickedly pushed on hostilities for the sake of military glory. Now what was the fact ? Here at the most critical period—when the General had certain information that the fiery cross had passed through the land, and that the Belooch clans had gathered, and were still gathering, round Hyderabad—when the foes men actually assembled outnumbered him by eight to one—so earnestly desirous was he to avoid bloodshed, that he risked the safety of his army, the prestige of the British name, and in all probability British supremacy in the East, by according a delay of seventeen days to the Ameers, which he felt morally certain would be employed against him by the assembly of thousands of additional enemies.

What should we not have heard of Sir C. Napier's facile credulity and weakness in granting this delay, if he had been beaten at Meanee ?

These things are of the past, and the English nation unmistakeably pronounced its verdict at the time ; but I cannot refrain from here saying, that the accusation solemnly made on the occasion I have referred to, against an absent general, who was literally wearing out his life in his country's service, was as shameful to the accuser as it was false in fact.

The most convincing disproof of this accusation is supplied by this fragment of a newspaper which I hold in my hand.

By the adverse statements of his enemies, the thanks of the Houses of Parliament to Sir C. Napier and his army for the victories of Meanee and Hyderabad were delayed for a whole year, in order to give time for the most searching inquiry ; that inquiry having been made, Sir Robert Peel, in February, 1844, in moving a vote of thanks, used the following language :—

"In his opinion there was conclusive proof, that if Sir C. Napier had passed one day inactively, or if he had attempted to retreat, or if he had not taken that course which his own wisdom combined with his military skill had pointed out, not one day could have elapsed without the army being cut off ; and a disaster would have occurred of which, following so closely on that of Cabool, the consequences it would be difficult to surmise. But estimating the conduct of Sir C. Napier, he must say he did not think his chief praise was his military knowledge or his personal valour : he thought his chief praise was this, that, seeing the position in which he was placed, he well and deliberately considered all the consequences likely to ensue ;—that, knowing the shock to the British Empire in the east, the danger that was incurred, the injury to its reputation from the disaster of Cabool, he, on his own responsibility, with less of local knowledge, with less of local experience, than those by whom he was surrounded, had the moral courage to act in opposition to their advice, and to that the army owed its safety."

On the 13th, in answer to Major Outram's renewed entreaties for further delay, written from Hydrabad, the General declared he would wait no longer, saying—"I have delayed at risk of the lives of my men, and of my own character as an officer, not to the eleventh but to the twelfth hour. If men die in consequence of my delay, their blood may be justly charged to my account."

On the 15th, the dream of Major Outram was rudely broken by an attack made upon his Residency at Hydrabad, by 8,000 Belooch warriors. His little escort, formed of the light company of the 22nd, after holding the post successfully for several hours, was drawn off on board steamers which the foresight of the General had despatched to Hydrabad, and steaming up the river, joined Sir C. Napier on the 16th at Muttaree, at which place he had arrived on his southward march.

Sir C. Napier knew that an overwhelming Belooch force was at Meanee, and its numbers were being hourly increased. He resolved to attack them at once. He had read the Duke of Wellington's remarks on Colonel Monson's disastrous retreat before the Mahrattas, and drew from them the conclusion never to give way before barbarians. "Let the Beloochees be sixty or one hundred thousand," he said, "I will fight."

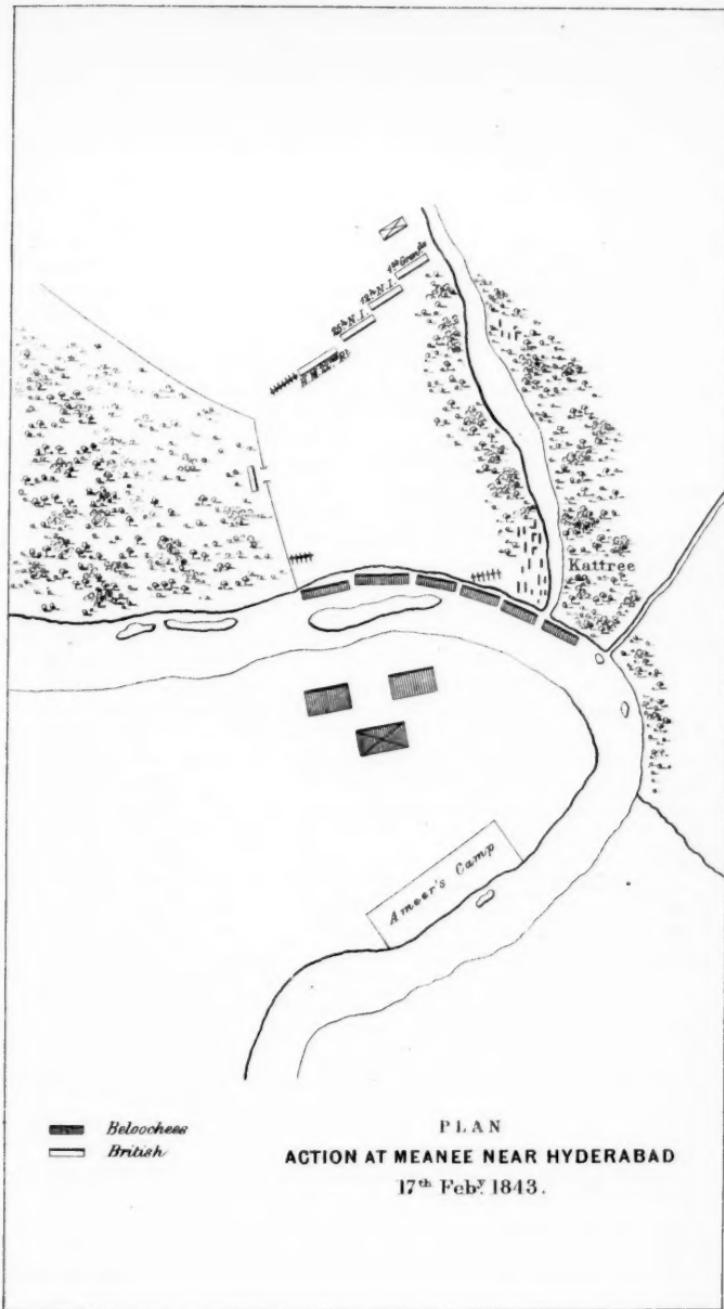
Before daybreak on the 17th he marched. At eight o'clock in the morning his line was formed in front of the Belooch position, which was very strong and defended by 30,000 men, 5,000 being cavalry.

The Ameers' front extended 1,200 yards along the dry bed of the Fulalilee River, the banks of which, sloping gradually down towards the plain in front like a glacis, afforded the infantry which lined them all the defence of a parapet.

The Ameers' left rested on a shikargah, or hunting forest, which was inclosed by a high wall having only one opening, a gateway, about midway between the Belooch and the British lines, that is to say, about 500 yards from each ; and in this shikargah 5,000 of the enemy's matchlock men were posted to sally out on the right rear of the British, so soon as they should be engaged with the Belooch main body in front.

The Ameers' right was also protected by a shikargah, which was intersected by deep nullahs running at right angles to the Fulalilee.

Their guns, fifteen in number, were in two masses on the flanks, and their

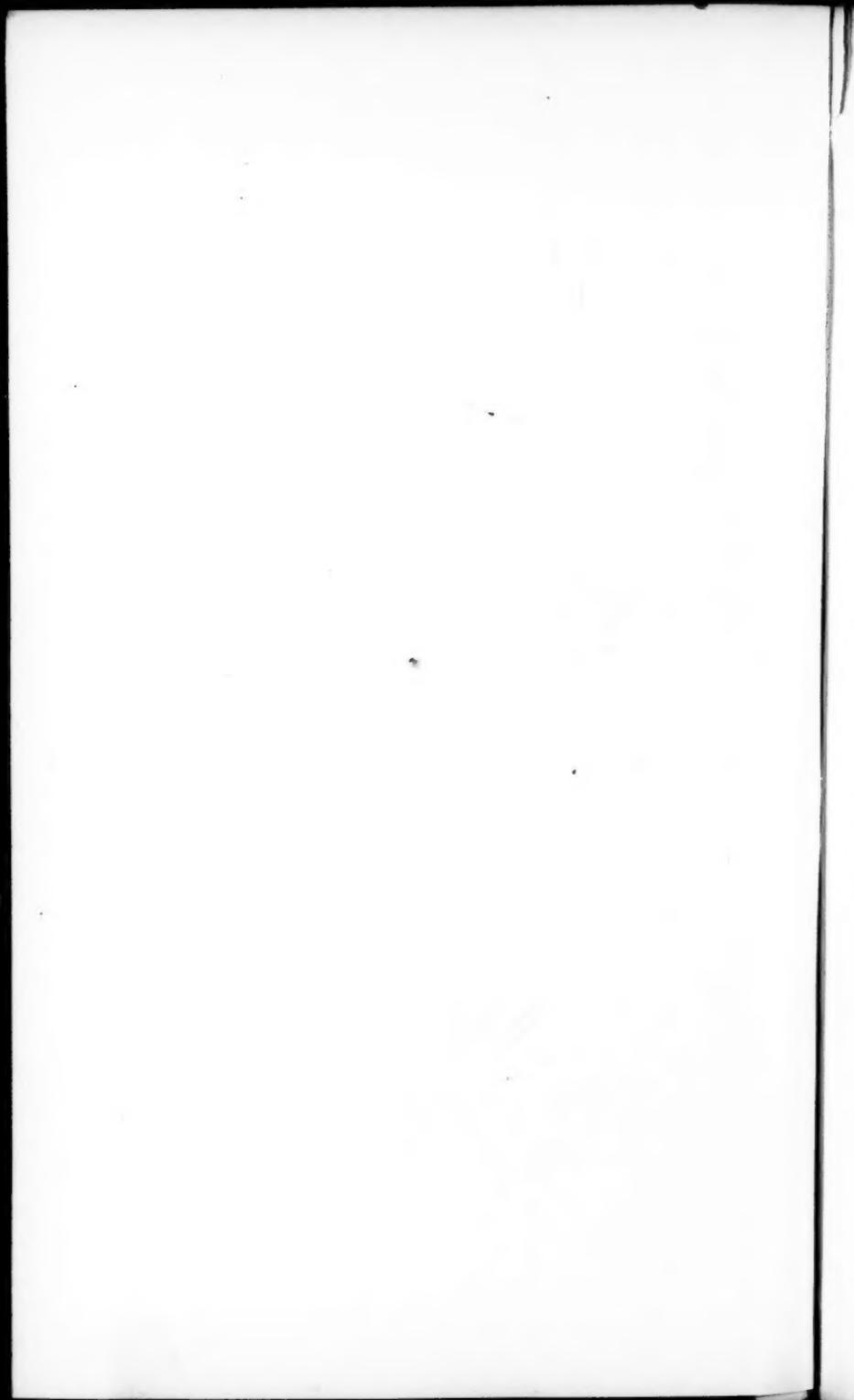


PLAN

ACTION AT MEANEE NEAR HYDERABAD

17th Feby 1843.

J.R. Jobbins



camp and cavalry were placed in a loop, formed by a sudden bend of the river to the rear.

At nine o'clock the British line advanced to the attack in echelon of battalions; the right, composed of two batteries and Her Majesty's 22nd regiment, being in front. The General's quick eye instantly detected the danger to which his right flank was exposed from the 5,000 matchlock men in the inclosed shikargah.

He rode near the wall, found it about ten feet high, not loopholed, and then, riding through the opening under a play of matchlocks, he observed there was no scaffolding to enable the enemy to fire over the top.

"Then," in the words of the historian, "the inspiration of genius came to the aid of heroism. Taking the grenadiers of the 22nd, he thrust them at once into the opening, telling their brave Captain Tew, that he was to block up that entrance; to die there if it must be, never to give way! And well did the gallant fellow obey his orders; he died there, but the opening was defended."

As the British closed to within 100 yards of the enemy, the voice of the General was heard along the line commanding the charge.

The guns on the right were run up into a position, whence they swept the dense masses of Beloochees diagonally.

The 22nd were on the top of the bank in a moment, thinking to bear down all before them; but they paused in amazement at the forest of swords waving in their front, which had been up to that moment concealed from their view by the elevated river bank.

It would be a desecration to attempt to convey the scene in any other than the language of Sir William Napier:—

"Thick as standing corn, and gorgeous as a field of flowers, stood the Beloochees in their many-coloured garments and turbans; they filled the broad deep bed of the Fulalilee, they clustered on both banks, and covered the plain beyond. Guarding their heads with their large dark shields, they shook their sharp swords beaming in the sun; their shouts rolled like a peal of thunder, as with frantic gestures they rushed forward, and full against the front of the 22nd dashed with demoniac strength and ferocity. But with shouts as loud and shrieks as wild and fierce as theirs, and hearts as big and arms as strong, the Irish soldiers met them with that queen of weapons, the musket, and sent their foremost masses rolling back in blood."

The battle lasted for three hours, and there was danger of the British becoming physically exhausted by the efforts necessary to repel the constant rushes of fresh opponents.

Under their repeated attacks even the 22nd were forced several times to give ground, but always their General was there to cheer and rally them. He remained during the whole of this conflict on horseback between the opposing lines, which were often not more than fifteen feet apart, and running nearly as much risk from the muskets of his own soldiers as from the matchlocks of the enemy. He exposed himself to greater danger than any man in his ranks, because he saw that it was a necessity; the 22nd were young soldiers, and if they had given way the battle would have been lost, and with it perhaps the British rule in India. But at his voice and demeanour their strength returned and they recovered their ground, though nearly deprived of regimental leaders, for those leaders had gone down fast, falling as British officers should, and always will do, when they cannot advance.

Milton's grand lines are so applicable to the English leader on this occasion that I cannot refrain from quoting them :

" If once they hear that voice, their liveliest pledge
 Of hope in fears and dangers ; heard so oft
 In worst extremes and on the perilous edge
 Of battle when it raged ; in all assaults
 Their surest signal ; they will soon resume
 New courage and revive."

In every battle there is a critical period which offers victory to that commander who first perceives it, and most promptly seizes the occasion. That crisis had now arrived. Jacob's horse having vainly attempted to penetrate the shikargah on the Belooch right, with the view of turning that flank, Sir C. Napier sent orders to the whole of the cavalry to charge in one mass full on the enemy's right. Dashing through the Belooch guns, the troopers crossed the bed of the river, charged with irresistible fury on the dense masses of the enemy drawn up in the plain beyond, and spread confusion along the rear of the Belooch line engaged in the Fulaliee.

Then at last the Eastern swordsmen wavered, and, pressed by the British, began slowly to retreat, not in panic or confusion, but in such large masses and with so determined a bearing, that the General did not deem it prudent with his exhausted troops to push the pursuit far.

Such was the battle of Meanee; and if we consider the individual bravery and strength of the Belooch warriors, and their numbers—for certainly not less than 28,000 were present on the field—as well as the strength of their position ; when we remember that Sir C. Napier's force engaged did not actually number more than 2,000 men, and the remarkable fact, that of these only 800 were Europeans, we must conclude that this was one of the most extraordinary battles that ever was fought.

Next morning, in answer to a summons from the General, so astounding was the moral effect of the victory, that six sovereign princes gave themselves up as his prisoners, and yielded the strong fortress of Hydrabad with its large treasure.

In Sir C. Napier's despatch, the names of private soldiers who distinguished themselves in battle were for the first time published to their countrymen ; and for this cause, if for no other, his memory ought always to be dear to the heart of the private soldier.

The battle had been won, and Hydrabad occupied, yet the situation of the victor was one of no small difficulty.

His force was considerably reduced, yet he was obliged to detach 500 men to garrison Hydrabad ; for that place was too far from the Indus, by which alone he could receive his supplies, to serve as a base or even as a dépôt, because he had not carriage sufficient to transport his stores over the four miles of road which separated the fortress from the river.

A fresh Belooch army was gathering at Meerpore under Shere Mahomed ; and the hot season was coming on apace, the mercury already indicating 112° in the shade.

The British General, hitherto so daring, suddenly became the most cautious of commanders. He judged that if he marched at once against Meerpore, the Amer would retire to Omercote, to entice the small British

force to its destruction from heat and sickness in the desert. But an appearance of timidity on his part would encourage Shere Mahomed to come to attack him, the very thing the General desired. Meanwhile he would gain time for the arrival of reinforcements from Kurrachee and Sukkur.

He accordingly entrenched a camp on the Indus to protect the steamer station, and to serve as his base; and in it he placed his hospitals and stores. But while thus presenting an appearance of timidity to his enemies, he was careful to guard against its affecting the minds of his own soldiers, by neglecting to avail himself of the protection of his camp, and obliging the troops to pitch their tents outside on the open plain; by this, and by other means, leading them to believe that he held the Ameer's army in contempt.

The weak British force now shewed like a small rock in the midst of a rising flood, which threatened to submerge it.

Shere Mahomed, at the head of a force whose numbers were variously reported between twenty-five and forty thousand men, advanced to within ten miles of Hydrabad, loudly boasting that he would "Cabul" the British.

All the hill tribes, encouraged by the confident bearing of the Ameer and by the apparent timidity of the British General, were preparing to descend into the plains.

Dawks were stopped and stations plundered. The reinforcements which the General expected from Sukkur ran great danger of being cut off and destroyed by the Ameer, whose position commanded the line of march of those reinforcements, at the same time that it threatened Hydrabad and the British camp on the Indus.

The situation of the English General was now full of anxiety.

His field force, reduced by battle and sickness to 2,000 men, had to perform a duty beyond its capacity; that is to say, it was required to garrison Hydrabad, to defend the camp on the Indus, four miles distant from that fortress, and to guard a large pleasure garden, half a mile from the camp, where the captive Ameers were confined; while a hostile army of 25,000 men occupied a central position only ten miles off whence it threatened at once these three fractions into which the British force was of necessity divided, and the reinforcements which were marching to join it.

It was not alone necessary to ensure the safe arrival of the reinforcements; but they must arrive, and Shere Mahomed's army must be beaten and dispersed, by the 25th March; because between that date and the commencement of the unendurable heat, barely time enough would remain for the reduction of the Ameer's fortresses of Meerpore and Omercote, without which he would be able to renew the war at any moment.

Without entering into details, which are however well worthy being studied, it must suffice to say, that, by a series of arrangements and operations which present a combination of great skill and sagacity, with that good fortune which all great commanders appear to share in common, the reinforcements were brought safely into Sir C. Napier's camp on the 22d.

On the morning of the 24th, with 5,000 men and nineteen guns, he marched against Shere Mahomed, who was strongly entrenched at Dubba with 25,000 men, defeated him with the loss of 5,000 men, seventeen standards, and fifteen guns, and completely dispersed his army.

The British loss was 270, of which number 147 were of the 22nd regiment alone, thus shewing, even in this favourable instance where the 22nd were unusually well-supported by the Sepoy battalions, how immense is the proportion of the fighting and the loss which Europeans always have to sustain when joined with Eastern troops.

This also was a wonderful battle. The ease with which it was won, and the disproportionate loss between the victors and vanquished, furnish the highest testimony to the skill of the General. But for that skill the loss of his troops would have been far greater; and if the slaughter of the Beloochees had been less, and their defeat less crushing, the war would have been prolonged, and a greatly increased loss of life would have been the result.

Sir C. Napier's opinion was, that the best method to save bloodshed for a soldier is to be master of his profession.

"How else," he said, "could I command with honour? How answer for the lives of those entrusted to my charge? An ignorant general is a murderer: all brave men confide in the knowledge he pretends to possess, and when the death trial comes their generous blood flows in vain! Merciful God! how can an ignorant man charge himself with so much blood? I have studied war long, earnestly, and deeply, yet tremble at my own deficiencies."

After the battle, the Ameer, with the discouraged remnant of his army, had retired on Meerpore, Sir C. Napier, one of the commanders who thought nothing was done so long as anything remained to do, prepared to follow up his stroke while the effect of the battle was fresh.

The troops had fought for three hours in the battle, with the thermometer at 110° in the shade. Their General gave them but eight hours' rest, and marched on Meerpore. His wisdom in pressing on was proved by the fact, that the troops in this march passed through two strongly entrenched positions which the Lion had prepared, and had intended to dispute, but which, in the panic immediately succeeding the action, he could not get sufficient men to defend. This, however, would not have been the case a few days later.

The day after the battle Sir C. Napier's cavalry was at the gates of Meerpore, forty miles from the field. The consequence of this vigour was that Shere Mahomed abandoned his capital, and fled with his family and treasure to Omercote.

Even while taking possession of Meerpore the General sent the Scinde horse, a camel battery, and a regiment of infantry in pursuit of the flying Ameer, who, thus pressed, abandoned Omercote as he had done Meerpore; and Omercote, the desert fortress, Shere Mahomed's last resource, 60 miles from the edge of the desert and 100 from the field of Dubba, opened its gates and was garrisoned by a British detachment just ten days after the battle. Shere Mahomed now became a wanderer over the face of the country, with few followers and without a resting place.

Meerpore and Omercote were both strong places, well armed and provisioned, and, if defended by a resolute enemy, might have detained the General in the field far into the hot season; thus enabling Shere Mahomed to gather a new force and to prolong the war.

The army had marched from its camp on the Indus to attack Shere

Mahomed on the 24th March. On the 8th of April it was back at Hydrabad, and Sir C. Napier slept in the palace of the Ameers, master of Scinde, having in sixteen days defeated 25,000 enemies in battle, captured two fortified places, and marched 200 miles under a Scindian sun.

Shere Mahomed however was still at large, and to complete the tranquillity of Scinde it was necessary to capture him. For this purpose Sir C. Napier again took the field towards the end of May, when the mercury stood at 130° in the tents. The Ameer had in the interval collected about 10,000 men; and the General drew a circle of troops round him to prevent his escape. On the 14th June Shere Mahomed made a dash at the weakest part of the circle, was beaten, and his force utterly dispersed by Major Jacob. The General heard the cannonade, knew that Jacob must be engaged, and feared he might be overwhelmed. On the 15th, while still in anxious suspense as to the result, he was struck down by sun-stroke at the same time with several other Europeans; he alone of all who were thus attacked was left alive at the end of three hours. He attributed his own recovery on this occasion partly to the reviving effect of the news of Jacob's victory, partly to his remarkable abstinence in eating and drinking.

Scinde was now conquered. "We have taught the Beloochee," said the General, "that neither his sun, nor his desert, nor his jungles, nor his nullahs, can stop us, and he will never face us more."

Most of the great feudal chieftains came in and took the oath of fidelity to the British Governor, and what is more they kept it. And the just and beneficent rule of Sir C. Napier conciliated to such a degree the respect and attachment of these wild warriors, on whom he had laid so heavy a hand, that long afterwards, when he was leaving India for the last time, at enmity with the East Indian Government, and when they had no longer anything to hope or fear from his favour or his anger, the Belooch Sirdars flocked in hundreds to pay their respects to him at Hydrabad, and asked leave to present him with a sword of honour. That sword is now an heirloom in his family.

The scene on this occasion has been described to me by an eye-witness, as having been as affecting as it was remarkable. All the avenues into Hydrabad were crowded by the great Belooch Chieftans and Sirdars of Scinde, the shaggy mountain ponies on which many of them rode shewing they had come from the distant hills. Many of them led their sons by the hand, entreating Sir C. Napier that he would lay his conquering hand on their young heads, in the belief that his touch would confer fortune and blessing.

Surely in the face of a fact like this, all detraction of his policy and humanity as an administrator—no less than of his skill and energy as a soldier—must be altogether vain. His was essentially the glove of velvet covering the hand of iron; and his touch was so light, that its force, exerted with crushing effect on evil-doers, was to the well-disposed and the loyal known only from memory or from its action upon the robber and the oppressor.

In reviewing the operations of which I have been able to give only a very imperfect summary, the first thought that suggests itself is the marvellous activity and endurance, both of mind and body, of the English General. During operations in the field, though in the saddle all day, he alone of all his force was habitually debarred from rest at night, and compelled to devote the hours nature has designed for the restoration of the exhausted body

to wearisome correspondence, of which the vindication of his fame from calumnious attack formed no small portion.

I do not believe either ancient or modern history furnishes a parallel instance of a man being called on for the first time in his life at the advanced age of sixty-two to command an army in the field under circumstances of so much complication and responsibility.

Thrown suddenly in the midst of the, to him, altogether novel field of Eastern intrigue, he yet unravelled all its threads with far more than the skill and tact of the oldest Indian diplomatist; and while his political *attaché*, a man who had been bred to the business, was so blinded and cajoled by the Ameers that he incessantly urged the General to take no offensive measures, thus throwing upon him an awful responsibility which few men would have been bold enough to face, — Sir C. Napier alone among his army, clearly perceiving the danger, disregarded the responsibility, and out of the "nettle danger" plucked "the flower safety," by attacking and defeating a force fifteen times his strength.

If it is seldom that we see consummate prudence tempering the ardour and confidence of a youthful general, it is rarer still to find the fire and vigour of youth animating the sagacity of the veteran. Sir C. Napier possessed in the highest degree the combination of these generally opposing qualities.

Sir C. Napier has been censured by self-constituted judges for undertaking important operations with an inadequate force — such, for example, as his march through the desert to Emaum-Ghur, and his attack on the enemy's position at Meanee. No man knew better than he the danger of despising an enemy, or the propriety of bringing to the decisive point every man, horse, and gun, that could by any possible foresight and combination be arrayed there. But in the course he actually pursued, he was governed by necessity — choice he had none.

There are some countries where the want of supplies and natural obstacles render it impossible to operate with a large force. Notably in Scinde, the scarcity of water at certain seasons, and the want of carriage at all times, formed two of these controlling causes. On account of the first, during the march to Emaum-Ghur, the General was obliged to keep with him only 400 men and to send the rest back.

The enterprise for difficulty would seem in prudence to have demanded 4,000 men; yet if he had taken with him only 1,000, he must have failed for want of water. He supplied the want of numbers by courage, hardihood, and perseverance, trusting to the moral effect of these qualities rather than to his apparent force.

It must be remembered that the British forces in Scinde were a mere handful, and could be outnumbered at any point, by ten times the number of enemies. In such a case, dependence on physical force alone, and a pedantic adherence to rules and maxims, would have only been to prolong the war, thereby encouraging the Ameers by an appearance of timidity, and probably calling to their aid the wild mountain tribes who were only waiting, to use a homely but expressive phrase, to see which way the cat jumped.

Both as regarded the prestige of the British name, and the character of his opponents, the moral was more to be considered than the physical effect.

It is one of Napoleon's sayings, that moral force in war is to physical force as four to one. If this be true in European warfare, where the

composition and courage of opposing armies is nearly equal, we must decide that in the case under consideration moral force was almost everything.

Although therefore Sir C. Napier occasionally disregarded mere technical rules, and placed himself in situations which to men of less transcendent ability would have been ruin, he did so because he measured correctly the capacity of his adversaries and his own; and that which in another might have been the extreme of rashness, was in him only the fruit of the most deliberate and just calculation.

The sun-stroke and the extreme labour he had endured so seriously affected his health at this time, that the medical men told him he must go to Kurrachee and quit work, or else he must prepare to give up life and work together. He went to Kurrachee; but would by no means consent to give up work. "If I take rest one day," he said, "the work doubles the next."

In October, before he had got over the effect of the sun-stroke, he was attacked by a terrible fever, which swept over the land, and carried off multitudes alike of natives and Europeans. Although the sickness was of a very depressing nature, the clearness of his mind never failed, and he was still emphatically the Governor of Scinde; and when his friends, who thought he was killing himself, urged him to resign and go to England, he answered, "No, not to save a thousand lives. The horses here are wild; but they know my hand; with another, they would start off as he was gathering up the reins."

For some months to come Sir C. Napier's labours were devoted to peaceful objects, to the improvement of the condition of the cultivator by altering the tenure of land, by abolishing slavery, promoting irrigation, &c.; and his memoirs on these and other great administrative reforms, drew from Sir Robert Peel the following remark: "No one," he said, "ever doubted Sir C. Napier's military powers; but in his other character he *does* surprise me. He is possessed of extraordinary talent for civil administration."

His efforts were however much interfered with at this time by descents made on the north-west frontier of Scinde by bands of desperate robbers, who from their numbers formed a small army. A wide desert interposed between their mountain strongholds and the frontiers of Scinde. But in the summer of 1844, having committed in some of their incursions acts of great atrocity, Sir C. Napier resolved to undertake their reduction. For this purpose however it was necessary to cross the desert, to track them to their strongholds, to hem them up in a corner where there should be no escape, and afterwards to transport them bodily to the plains, and compel them to labour instead of robbing for their bread.

At some future time, perhaps, it may be my privilege to describe in this theatre, clearly and in detail, this hill campaign, which was, in my belief, as remarkable and as difficult an operation as was ever undertaken by a military commander. I must now content myself with saying, that after a campaign of fifty-four days, commenced on the 16th January, 1845, he returned, after having completely succeeded in all his objects.

He had crossed the desert, tracked the freebooters, 16,000 men, under their chief Beja Khan, a man of Herculean strength and courage, through mountains which for defiles and hidden caves were like a rabbit warren, and shut them up finally in their famous stronghold of Trukkee with their wives

and families, where he induced them to surrender with the loss of only a few lives. Thenceforth such was the terror of his name that so long as Sir C. Napier remained Governor of Scinde, life and property were almost as secure as in England.

During this campaign he had to bear with the despondency of his own officers, he alone perhaps among the officers (for the men having less knowledge had more faith) feeling any confidence in the success of an enterprise which to others appeared hopeless.

He had to overcome the enormous difficulties of feeding his force, by organizing supplies from the rear; to circumvent the proverbial hill craft of his mountaineer enemies, the duplicity of his guides, and the uncertain fidelity of his allies. With a master hand, and a master spirit, he converted all these disadvantages to his own favour, thus illustrating a passage in Plutarch's Life of Philopœmen, where he says that great man, "adopting the Cretan customs, and using their artifices and sleights, their stratagems and ambuscades against themselves, soon shewed that their devices were like the short-sighted schemes of children when compared with the long reach of an experienced general."

The robber tribes captured were removed to the plains on the frontier, where they became cultivators of the soil, and received land from the government on the tenure of military service against the incursions of their kindred robbers; and the measure has proved in fact to be completely successful.

Sir C. Napier now returned to his works of peace, but they were not long destined to be undisturbed. So early as February 1844 he had predicted that a war with the Sikhs was inevitable. He now, with his remarkable forecast of mind, matured the plans which he foresaw he would be called upon to execute with the army of Scinde as an auxiliary to the principal British force on the Sutlej; and it was during this interval, and in preparation for that contingency, that he organized his famous camel baggage corps.

In June 1845, perceiving that the storm was about to burst, he wrote to the Governor-General begging to be allowed to organize an auxiliary force. But Sir H. Hardinge, who still thought at that time the war might be averted, would not allow of any preparation being made, for fear of alarming the jealousy of the Sikhs, promising however that Sir C. Napier should have six weeks' notice for the organization of his field force before the commencement of hostilities.

The Sikhs however gave no notice, and the news of the battle of Moodkee, fought on the 18th December, was the first intimation he received.

Then indeed he was ordered to assemble at Roree with all possible speed a field force of 15,000 men, 10,000 of whom must come from Bombay, as the resources of Scinde were unequal to this demand.

Sir C. Napier had been forbidden to purchase even a camel in anticipation. Thus, when the sudden order arrived, he had carriage for only 3,000 persons, when carriage for nearly 50,000 was required, that being the gross total represented by an Indian army of 15,000 fighting men; and though the Bombay complement of this force numbered 30,000 and had to be marched, after landing at Kurrachee, nearly 400 miles, yet on the forty-second day after the receipt of the order, the whole force required was concentrated at Roree in a perfect state of equipment and discipline; provided with a siege train of thirty-two pieces with 1,000 rounds a gun; eight field

batteries; engineer park and provisions for three months; as well as a pontoon train bearing 300 yards of bridge.

Only officers who have been called on to organise a force hastily under circumstances of similar difficulty can at all appreciate such a result.

Sir C. Napier's general plan was to create a diversion by marching on Mooltan.

The details were :—

To form his principal magazines at Ooch, situated at the confluence of the Chenaub with the Sutlej.

To divide his force between Ooch and Bhawulpore; to bridge the river at those places, and to make a concentric movement with those two columns on Shoojuabad, which place must be taken. The siege train to ascend the Chenaub in steamers, protected by the Ooch column, which would move along the left bank of that river.

To provide for retreat in case of necessity, a double bridge head was to be constructed at Ooch, and armed with the steamer guns. The defence of this *tête de pont* to be entrusted to the Bhawulpore levies, on which he could rely, so that he should be free to march on Shoojuabad with his whole force.

Shoojuabad being taken, to form an expense magazine at that place, which would then become his base of supply for the siege of Mooltan.

If he succeeded in taking Mooltan, of which he felt little doubt, as he was in correspondence with parties within the walls, that town would be his pivot for further operations. A powerful diversion would already be effected, which would be certain to relieve the British army on the Sutlej of a great deal of pressure; and the advance which Sir C. Napier then contemplated on Lahore, would draw off the Sikhs altogether from the Sutlej to protect their capital.

The General's plan was to move up the Indus from Roree in two columns, one on each bank, with the steam flotilla between them; to pass his whole force to the right bank at Mittenkoke, where he first expected to meet with resistance, and to crush that town under the concentrated fire of his eighty guns. This, he observed, was rather like "killing a gnat with a sledge-hammer"; but, besides the value of time, he knew what dangerous opponents the Sikhs would be behind stone walls, and his object was to terrify Shoojuabad and Mooltan by the example of the sudden destruction of Mittenkoke.

He had laid his plans for raising the population, which was unfriendly to the Sikhs, as far as Deyrah Gazee: and if he had been permitted to assemble his army as early as he had desired, he would, in all probability, judging from his past successes, have burst on Lahore with 25,000 fighting men long before the battle of Sobraon.

But it was otherwise ordained; for the battle of Ferozeshah had been fought, and the Governor-General suddenly ordered Sir C. Napier to quit his army, and come in person to the head-quarter camp on the Sutlej.

Arrived at the Governor-General's camp on the 3rd March, he found the victory of Sobraon had been won, that a treaty was in progress, and that his projected campaign must remain only a project for ever.

Of the treaty then concluded he altogether disapproved, believing that the only way to avert a second struggle was to annex the Punjab at once; whereas, he said, "if a puppet king like Duleep Singh was established, the

battle would have to be fought again, rivers of blood would flow, and the result might be doubtful."

In two years from that time, Mooltan, Ramnuggar, Chillianwallah, and Goojerat, bore testimony to the truth of the prediction.

Sir C. Napier quitted Scinde in January 1848. When he first set foot in that country he found society without the protection of law ; slavery was widely spread ; murder, especially of women, of almost daily occurrence ; robbery universal ; the only law was that of the strongest.

When he quitted Scinde he left it without a slave. The turbulent Beloochees whom he had found with sword and matchlock, the licensed robbers and oppressors of the poor, had been compelled by him to shoulder the spade and mattock, and were submissive to a constable's staff.

He had in short found a divided population ; misery and servitude on the one hand—on the other, a barbarous tyranny. He left an united regenerated people, rejoicing in a rising civilization, the work of his beneficent genius.

The second Sikh war broke out, and in March 1849, just a year after his return, Sir C. Napier again quitted England for India ; his appointment to the supreme military command in that country having been most unwillingly forced on the East India Company, by an unanimity of public feeling rarely witnessed.

And so, at the age of sixty-seven, suffering most painfully from old wounds and labouring under a mortal internal disease, he gave up the honourable and honoured repose he had so hardly earned, quitted his wife and children, and, in the words of the facetious philosopher *Punch*, "he took his two towels and his piece of soap, and his scimitar, and he went away to the ship which was to carry him to the sea."

Arrived in India, he found that Lord Gough had in the interval completely broken the power of the Sikhs, and the war was at an end.

Henceforward he had to perform the ordinary duties of Commander-in-Chief. At the end of a year of hard labour, his public career was suddenly brought to a close by a circumstance which is of sufficient importance to be detailed, since it has been misrepresented to Sir C. Napier's disadvantage.

By a regulation of the Indian Government, Sepoy as well as European regiments were entitled to increased pay when serving beyond the frontier of the British dominions. Under this regulation the troops stationed in the Punjab received that increased pay up to the period when the Punjab was annexed. When that country was declared an integral part of the British Eastern Empire, the extra pay was suddenly stopped.

And how was it stopped ?

No account was taken of the feelings of human nature in general, which are accustomed to view with decided disrelish any diminution of creature-comforts once enjoyed.

No account was taken of the susceptibilities of the Sepoy soldier in particular, which had already on more than one occasion, within Sir C. Napier's own experience, manifested themselves in open mutiny on this very question of reduction of pay.

The extra pay was simply stopped by a dry official order, without explanation, without reflecting on the danger of tampering with the pay of mercenaries, who, while they were bound by no tie of fidelity *but* their pay, had

many grounds of estrangement in differing religion, colour, and race; mercenaries too of such power, that once aroused nothing could control them.

Although Sir C. Napier disapproved, as any man of common sense must do, of this "*modus operandi*," he set himself to enforce the order and to repress the mischief he feared would result from it. The discontent, as he foresaw, spread widely.

Two regiments in the Punjab refused to receive the reduced pay, and an active correspondence was discovered to exist between them and other corps, some of them already in the Punjab, others under orders to proceed thither.

The 41st Native Infantry at Delhi, 400 miles from the other malcontents, refused to enter the Punjab without the higher pay; and it was well known that many other regiments were prepared to follow their example. Sir C. Napier by dexterous management checked the disaffection in the 41st, and the regiment marched.

But another regiment, the 66th, just arrived from Lucknow, broke out into open mutiny, and actually attempted to seize Govind-Ghur, one of the great fortresses of the Punjab, which was in the midst of the most disaffected portion of the Sikh population.

The danger was very menacing, yet by tact and firmness it was averted. The severest punishment which the Government could inflict on a whole regiment was to disband it; but the disaffected felt sure this measure would not be resorted to, as the discharged soldiers must be replaced, according to immemorial usage, by men of the same race and religion, their brothers and cousins. Indeed the Brahmins openly boasted that the Government could get no soldiers if they chose to stop recruiting.

Sir C. Napier however broke through the trammels of Indian routine, disbanded the 66th, and gave its colours and number to a Ghorkah battalion, which henceforth became the 66th Native Infantry.

By this move he check-mated the mutineers. To have disbanded the regiment as a solitary measure would only have been productive of mischief; the Sepoys felt sure the Government could not go on playing that game; they could not disband a whole army; but when they found Government was prepared to replace them by men of a different race, they trembled to incur the same penalty as the 66th had suffered, and murmuring was at an end. I should here mention that the Ghorkahs make far better and braver soldiers than the Bengal Sepoys generally.

The Governor-General approved of Sir C. Napier's action of disbanding the 66th, but disapproved of his adoption of the Ghorkas in their place, the only thing that could give point or efficacy to the measure.

Now comes the point to which I desire particularly to direct attention:

Twelve days before the mutiny of the 66th at Govind-Ghur, a new commissariat regulation of the supreme Government, unimportant in itself, came into operation. This regulation caused the usual allowance made to the Sepoys for purchasing their food to vary with the market prices of the places where they were stationed. It happened that its operation in the Punjab itself would be to diminish—to a very trifling extent indeed—but still to diminish, the pay of the Sepoy in that province. Sir C. Napier judged that to promulgate and enforce this ordinance, at a time when, as was proved twelve days later by the Govind-Ghur mutiny, very serious dis-

affection existed on account of the reduction of pay already enforced—I say the General judged that to enforce this new ordinance, further reducing pay, would make the smouldering embers of sedition blaze forth, and would be in fact an act of judicial madness.

It was not the amount, for that was trifling; it was the fact that it was a *further reduction*, in the state in which the Sepoys' minds were at the time, that constituted the danger. Sir C. Napier took it on himself—in entire accordance with the opinions of Sir Patrick Grant, Sir Walter Gilbert, and General Hearsay, officers of great Indian experience—to suspend—not to annul, but to suspend—the operation of this as yet unknown measure, until its impolicy could be represented to the supreme Government. The whole sum thus withheld from Government only amounted to a few pounds, although that does not of course affect the principle.

For thus overstepping his legal powers Sir C. Napier was, by the Governor in Council, publicly and offensively reprimanded, the general order conveying the reprimand being signed by a major in the Indian army under his command. He was forbidden ever to exercise his discretion in such matters, or under any circumstances, again; and the Commander-in-Chief immediately tendered his resignation of a post which he could no longer occupy with advantage to the public, or with honour to himself.

Any one who will take the trouble to go into this matter will find that I have simply stated facts, and no ingenuity can pervert them.

I will not trust myself to remark on this treatment—a treatment which Sir C. Napier's position, age, and great services ought to have rendered impossible. I will only say that I cannot conceive the possibility of any impartial mind, endowed with the commonest powers of reasoning, which should investigate all the circumstances connected with this suspension by the General of the regulation referred to, without arriving at the conviction that Sir C. Napier was wholly and absolutely in the right; and I will say further, that an officer in his situation would be unworthy to be trusted with any command who would not act in the same manner in like circumstances.

Sir C. Napier landed in England in March, 1851. In August, 1853, he died, after the most acute sufferings, borne with the utmost fortitude and even cheerfulness.

The following quotation from a memoir drawn up by Colonel Rathborne, an able and experienced Indian officer who had served under Sir C. Napier in the field as well as in the posts of magistrate and collector of Scinde, shews how that great man was considered by his subordinates:—

“ It is not merely because I have eaten his salt that I am faithful to Sir Charles Napier's memory and to Sir Charles Napier's cause—I am faithful to it from the knowledge that he was really and truly one of the noblest and most admirable of England's sons, and would, had he lived and had he possessed the power, have been the regenerator of England, and the saviour of our empire in the East. He would have fixed the foundations of that empire on the surest basis, justice to the people, securing the people's love. He would have made India a country to be a help to England in its necessities, instead of a sink to absorb alike its treasures and its men. He would have covered its surface with roads and canals, instead of devoting its

resources to the maintenance in luxury of the drones who now over-spread it."

Posterity will not fail to note that the warrior, who, when feasting and rejoicing were the order of the day, was laid aside and forgotten like a rusted tool, was called from his retirement by the unanimous cry of a nation, as the only man who could save the Indian Empire when supposed to be in utmost peril. It will note well,—that this man who was forgotten at the feast, was the first to be remembered in the fray.

To the judgment of that posterity we may safely leave the heroic character and great actions of Charles James Napier, on the one hand: and on the other, the conduct of the ministers of the day, who failed to do honour to themselves by honouring him.

His deeds have been imperishably recorded by the great writer, whose eloquence in this theme was animated and warmed by the most devoted brotherly affection.

He also has passed away from among us, the last of that noble band of soldier brothers, whose bravery, whose wounds, and romantic mutual affection, were as household words in the camp of the great Peninsular army.

Few episodes in history are so elevating, and at the same time so touching, as the record of the early military life of Charles, George, and William Napier.

I again quote from the speech of Sir Robert Peel, made on the occasion already referred to. Speaking of the critical state of affairs when Sir C. Napier took the command in Scinde, he says:—

"It was most fortunate that at such a crisis, and under such circumstances, the command of the British army was upon those days committed to one of three brothers, who, engrafted upon an ancient stem, graced the brigade to which they belonged, by that perfect nobility which derived its brightest lustre from an unblemished private character, and the highest sense of the purest honour, and whose fame, won by repeated proofs of valour in the field of battle, had made their name conspicuous in the annals of history. They had learned—each of the brothers had learned—the art of war under an illustrious commander. During the whole of his military campaigns—of which one of them was the faithful, the impartial, and the eloquent historian; during the whole of those campaigns the exploits of these three brothers were such as to entitle them to the gratitude of their country. In almost every action in the Peninsula they had given proof of their military skill and valour; but in the actions of Corunna, of Busaco, and Ciudad Rodrigo, and during the operations of the Pyrenees, none of the gallant British officers or men were more prodigal of their blood in the cause of their country, than each of the officers to whom he alluded."

England, whose vines bear such clusters, whose mothers bring forth such sons, will never call in vain for men worthy to uphold her honour abroad or to defend her sacred soil; and, though their names are as yet concealed behind the veil of the future, let us hope and confidently believe, that, when the emergency shall arise, the mantle borne by those noble soldiers, transmitted to them, his most illustrious pupils, by their great master, will be found to have devolved on shoulders worthy to bear it.

There was a remarkable similarity in the characters and dispositions of Charles and William Napier. To say that they had faults is only to admit that they were human. But their most ardent opponents, enemies now no longer, could never accuse them of anything mean or little. Their faults were those of noble and generous natures.

They seem to have adopted from their childhood as their rule of action, the motto "*parcere subjectis et debellare superbos*," and none ever acted up to it more consistently. The readiness with which any story of oppression or wrong was received—sometimes perhaps on insufficient grounds—and the fierceness with which it was denounced; all resulted from a tenderness of nature, which, towards the weak and the helpless, and remarkably towards women, children, and animals, was absolutely womanly.

Ever since his return from active service under Wellington, Sir William Napier's was a life of almost constant suffering, caused principally by a bullet which, having lodged near the backbone, could never be removed.

During the last two years his sufferings were unremitting and intolerable, and I shall ever remember, as one of the most impressive lessons of my life, that I was permitted to witness the fortitude, patience, cheerfulness, and consideration for those about him, with which those sufferings were borne.

None who read the clear and vigorous letters which from time to time, up to a few weeks of his end, appeared in the newspapers, could at all guess the state of torture in which the writer lay; or could appreciate the sublime victory obtained by the indomitable soul over the weak and suffering body.

To him the British army owes more than to any man who has ever lived—for has he not *immortalized* its achievements?

To his pen the great Duke himself is more indebted for the completeness and permanence of his fame, than he is to his own great deeds.

To him finally—and this would have been his proudest boast—the private soldier owes more than to any other man, for his was the first voice to advocate the right of the private soldier to share individually in the honour, as he has always done in the dangers, of the battle-field; and it is remarkable that this right was first practically admitted and stamped as inalienable by his brother in the despatch of his first victory of Meanee.

To the last Sir William Napier delighted in the society of young men, particularly officers. He was always pleased to impart information and to discuss with them the subjects of the day; and the patience, even deference, with which he listened to their opinions in return, shewed a humbleness of mind, which those perhaps who did not know him intimately would have been slow to attribute to him.

The love and the reverence with which he inspired those who thus came in contact with him, partook of the feelings with which a clansman regarded his chief. For the numerous officers who used to repair to his bedside to hear words of wisdom, clothed, as they involuntarily were, with marvellous force and eloquence, his removal has created a gap that can never be filled. But his words and his memory will live in their hearts, and his name will never be forgotten so long as and wherever the English language shall be read.

Friday, May 4th, 1860.

Colonel The Hon. JAMES LINDSAY, M.P., in the Chair.

SUBSTANCE OF A LECTURE ON MILITARY TRANSPORT
BY SEA AND COLONIAL RELIEFS.

By C. ALEXANDER WOOD, Esq., late one of Her Majesty's Commissioners of Emigration.

It is proposed to divide the Lecture into the following heads :—

- I. The Lecturer's opportunities of acquainting himself with the subject to be discussed.
- II. The Importance of an efficient Transport Service in Peace and War.
- III. The Relief System, and especially as regards India.
- IV. Evils resulting from a Defective Organization of the Transport Service.
- V. The Organization recommended in substitution.
- VI. Conclusion.

I.—THE LECTURER'S OPPORTUNITIES OF ACQUIRING A KNOWLEDGE OF THE SUBJECT TO BE DISCUSSED.

1. A connection with the late Lord Hardinge, as his private secretary, during the whole of the time he was Secretary-at-War, under the Government of the Duke of Wellington, enabled the lecturer at an early period to become familiar with many matters relating to the organization and economy of the British army. It was, it will be remembered, in 1830, shortly after the accession of William IV., that Sir Henry Hardinge's Pension Warrant, and other important measures which he brought forward, were promulgated. To assist in their preparation the Secretary-at-War had summoned from Edinburgh, towards the close of 1828, the late Doctor Henry Marshall,* and, as he chiefly worked in the private secretary's room, the Lecturer thus became acquainted with that remarkable man, to whom Lord Hardinge considered much credit was due, for many valuable suggestions affecting the condition of the British soldier. This early connection stimulated an interest, which later associations have increased, in all that concerns the soldier's welfare.

2. As regards shipping, the Lecturer's knowledge is derived from fourteen years' experience as a Commissioner of Emigration; and, in support of his claim to speak with authority on the transport of human beings by

* Afterwards employed with Sir Alexander Tulloch in the Army Statistical Department. Author of the "Miscellany," "Marshall on Malingering," &c.

sea, he will cite a passage from his pamphlet,* published in March, 1859, on the same subject as the present lecture:—

“ During a period of ten years—commencing with that of the Irish famine and ending with 1856, when the Emigration Commission was reduced—this Board, besides superintending the spontaneous emigration from the United Kingdom, amounting to nearly three millions of souls (2,798,163), collected by its agency, and contracted for shipping off to distant colonies, no less than 250,000 souls, including, in addition to Europeans from the United Kingdom, negroes and coolies conveyed from Africa and India, to and from the West Indies.

“ These arrangements—involving nearly a thousand contracts of affreightment, besides agreements for dépôts, &c.—the Board accomplished without a single case of litigation, with very slight mortality, *and the loss at sea of only one ship attended with any loss of life.* (*'Guiding Star,' 1,475 tons, a new ship, not heard of after leaving the Mersey, Jan. 1855, on her first voyage.'*)

He trusts that he need not say more to convince his audience that he is familiar with the subject which they have met to consider; and, as his object is to mitigate the hardships of brave men, and to afford them more frequent opportunities of enjoying Home Service, he feels sure that he will meet with sympathy and a patient hearing.

II.—THE IMPORTANCE OF AN EFFICIENT TRANSPORT SERVICE IN PEACE AND WAR.

1. The diagram† exhibits, marked in red, all military stations scattered through Europe, Asia, Africa, America, and over the continent and dependencies of New Holland. For these, periodical Reliefs—*involving extensive shipping arrangements*—have to be provided. With respect to the division of Home and Foreign Service, it is understood to be regulated in the proportion of one-third Home to two-thirds of Foreign Service. It is believed, however, that, under the present organization and system of Reliefs, the infantry of the line does not enjoy its one-third of Home Service, and the hope is entertained that, by a plan of chartering transports—which will presently be explained—foreign service may be shortened and quicker Reliefs effected for the Army abroad, without any additional cost for transport—and with a great gain of health, efficiency, and attractiveness.

As illustrative of the severity of the present system, the following particulars regarding a few regiments now stationed abroad may be mentioned. These regiments are known to the lecturer, but, for obvious reasons, he will not specify them. One, in 30 years, has been 24 abroad and 6 at home; another, in 26 years, 20 abroad and 6 at home; a third, in 38 years, 33 abroad and 5 at home; a fourth, in 40 years, 34 abroad and 6 at home; and a fifth, in 33 years, has served 26 abroad and only 7 at home. This last instance is rendered all the more remarkable by the honorary distinctions borne on the colours and appointments of the

* “On Military Transport by Sea.” By C. Alexander Wood, Esq. William Clowes and Sons, 14, Charing Cross, 1859.

† Exhibited in the theatre of the Institution.

corps, namely—"Egypt," "Talavera," "Busaco," "Fuentes d'Onor," "Ciudad Roderigo," "Badajoz," "Salamanca," "Vittoria," "Nivelle," "Orthes," "Toulouse," "Peninsula," "Alma," "Inkerman," "Sebastopol."

There needs, surely, nothing more to show the severity of the service.

The hardships of the Colonial Service admit of being mitigated by improved transport arrangements, but still it is feared not effectually, without a reorganisation of the infantry of the line; for, unless battalions exist to be conveyed, facilities for their conveyance are manifestly useless. If therefore it be desired—which undoubtedly will be the case—to shorten Colonial Service, then it becomes a matter of primary importance that the infantry organization offer no impediment: whether it do so or not will be a difficulty dealt with under the next heading. But to return to transport. On behalf of the Army, the lecturer claims a frugal use of all money appropriated by Parliament for that purpose.

In 1858, a Committee of the House of Commons placed on record the following opinion:

"That steamers should for the future be always made use of, as far as possible, in *urgent* cases; but that, for the transmission of the ordinary Reliefs, the Committee would not recommend the adoption of so costly a mode of transport."*

This opinion was recorded with reference to transport to India. But its soundness and its general application to all ordinary colonial Reliefs cannot be questioned. Hence, with reference to an economical use of the transport vote, now borne on the Navy Estimates, it would seem to be indefensible to employ for ordinary Reliefs an expensive class of steam troop-ships like the "Transit," "Simoom," "Perseverance," "Himalaya," &c. If, however, such ships are kept in commission strictly for navy and not army purposes, then their use for the conveyance of troops cannot be objected to. But in that case this most costly item ought not to be charged to military transport. Later, in developing his plan, the Lecturer will explain how cheap and good shipping may be obtained,—a question of great importance at the present time, on account of the magnitude of the Indian Army. It may be premised that, for some years before the Mutiny, the moveable portion of this army averaged only 27,000 rank and file. It has since been raised to between 70 and 80,000. Now, the casualties of this army, according to one statement, are 10 per cent. per annum; but, according to another and safer estimate, they amount to as much as 12 per cent. annually. That is, supposing these casualties to remain undiminished, the force deemed necessary for the safety of India will have to be renewed nearly every eight years.

Now, adverting to the other heavy demands on our recruiting resources, to the fact that recruits cannot be had except by voluntary enlistment, and also to the recurrence and probable continuance of the Irish exodus, it is very important that there should not be any unnecessary waste of military resources, and that the Indian casualties should be, if possible, diminished. It will presently be shown what an important influence may be exercised in this direction by an efficient transport service. But it is necessary first to consider the next division of the subject.

* Vide P.P. 1858, East India Transport.

III.—OUR RELIEF SYSTEM, AND ESPECIALLY AS REGARDS INDIA.

Reliefs are now effected by periodical drafts, supplied to every ten service companies from two dépôt companies, formed into dépôt battalions.

The dépôt companies comprise all unserviceable men detached from the service companies—invalids and recruits. Those companies connected with battalions in India and thus composed, with a maximum strength, if not improperly exceeded, of 200 recruits and invalids, have each to furnish every summer, according to existing casualties, at least 120 men, suited to an Indian climate, properly trained, and prepared to contend against all difficulties to be overcome, both by sea and land, in joining—often it is feared without even the protection of trustworthy non-commissioned officers—the head-quarters of a corps, distant many thousand miles. Whether this system be one likely to produce satisfactory results is a question for military authority.

The late Commission on the Organization of the Indian Army, in answer to the fifth* question submitted to them, have recommended a continuance of this system, with only the slight modification of reducing to twelve years the period of Indian service.† This, however, is a recommendation which practically, in the present state of the law, could not be carried out; and the period is now reduced to ten years. But Indian service, for most arms, cannot be protracted much over eight, seeing that enlistment is limited to ten, and that nearly two must be consumed in training and on the voyage. If, therefore, the period be not further reduced, all men sent out will have to be brought home, not to do further duty in Europe, but to be discharged,—with a disgust for the service, easily explained by this unduly protracted relegation to a tropical climate.

The effect of the present system has been described by an officer lately returned from filling a high command on the Staff of the Indian Army in the following terms.

He states, "that it is impossible for any one who has not witnessed, as he did, the successive arrivals of undisciplined recruits, to realise the fearful exhaustion which takes place under the present system." He further states, "that he observed a marked contrast between the drafts and entire battalions. That the former invariably arrived disorganised and sickly, while the latter, for the most part, were in good health and discipline."

Without offering on this point—obviously a professional one—any opinion of his own, the Lecturer, nevertheless, thinks it right to draw attention to the valuable "Paper prepared by an Officer of Rank," which

* 5th Question. The best means of providing for the periodical Reliefs of the moveable Army?

† The Commission also recommended the establishment at the Cape of a Convalescent Station. But it is believed, that, for the soldier drooping from a tropical service, native air and home influences alone will be found efficacious; and that his removal to a colony where a coloured population, less civilised than that of India, exists, would prove anything but beneficial. The selection in India for military stations of healthy localities, and the construction there of proper barracks, are useful and necessary measures too obvious to require the support of medical or statistical authority.

was read here on the 23d of March last, by the gallant officer who presides to-day. At p. 7 of this important paper, now known to emanate from the highest authority, there is an opinion in favour of instituting for Reliefs by drafts, Reliefs by entire battalions. And it should be borne in mind, as an additional argument for this change, that the men would, by this latter arrangement, be always in organised bodies, and available on the high seas for imperial purposes, while for such purposes drafts are valueless.

With regard to the proper period for a Relief, it is observed, also by the same high authority, that, "with the improved means of transport to India, it would be very desirable that every battalion should be relieved when it should be found unfit for active service by sickness or loss in battle; and that every corps should be relieved after *nine years'* service in India." For reasons above assigned, that period would be too long; and, following the principle here recognised, namely, that a corps should be relieved when no longer effective, it is believed that "five years" will be the safer limit for the recurrence of ordinary Reliefs.

In support of this opinion, the lecturer would again cite the authority of the officer before referred to, as lately returned from a command in India. He states, that when there he made particular inquiry as to the duration of Indian service, and he is confident that a close inspection of official returns will support him in the opinion, that, on the average, men do not serve in India *continuously* for more than five years. Some are invalidated and go out a second time, and thus regimental records may show men of more than five years' service, but then it is not continuous. Sir Edward Lugard, in his evidence* before the late Commission, mentions the case of the Buffs, kept in India for 19 years, of whom just one man and an officer came home with the colours of those who had accompanied them from England.

By the aid of an esteemed friend, the Lecturer is able to refer to the eminent authority of the late Sir Joseph Banks in favour of short tropical service. In the autobiography† of Mr. Waterton, the naturalist, the following interesting passage occurs. He states, that, referring to "low and swampy countries within the tropics, in general very insalubrious and fatal to European constitutions," Sir Joseph Banks "particularly impressed on his mind," "that you may stay in them for three years or so and not suffer much. After that period, fever, and ague, and probably a liver disease, will attack you, and you will die, at last, worn out, unless you remove in time to a more favoured climate."

This was, as Mr. Waterton describes it, "the admirable advice" of Sir Joseph Banks, and his friend adds "that he followed it with great success in Dutch Guiana for several years, coming home at intervals agreeably to the excellent and necessary advice which he had thus received."

The laws of nature do not vary, and if the late Indian Commission had not been necessarily so long occupied on the fourth‡ question of the inquiry, and could have found time to examine Dr. Balfour, the present able chief of the Army Medical Statistical Department, it is believed that they would

* Page 147.

† "Essays on Natural History," by Charles Waterton, Esq. First Series, p. 41.

‡ 4th Question. The composition of the Army?

have elicited from that gentleman much valuable information on the effects of a prolonged tropical residence. He would probably have been able to dispel the erroneous impression, conveyed by evidence and returns laid before the Commissioners, that in India the greatest mortality necessarily occurs among new comers. This is believed to be a fallacy, founded on the experience of unhealthy stations and a defective system of Reliefs, and which is now disproved by the fact, established since the Commission sat, that in 21 regiments of 16,688 rank and file sent to India in 1857-8, and not engaged, the mortality during the first year after landing was only 622, or at the rate of $3\frac{7}{10}$ per cent., which is below the average of a series of years.

Some extracts* from the able and interesting reports of Sir Alexander Tulloch and the late Dr. Henry Marshall, relating to the effects of a prolonged residence in the West Indies, Ceylon, and the Mauritius, may be cited to negative this supposition that the greatest mortality would be amongst the newly arrived. The contrary appears to be the rule, with the single exception of deaths caused by epidemics, which do appear to be more numerous among recruits than among old soldiers.

This is explained by the predisposing influence of fear,—fear to take disease, and fear to succumb to it.

But one important circumstance in favour of short Indian service, it is especially the duty of the Lecturer, as a point identified with emigration experience, to bring prominently under review: viz.

If service be reduced to five years, then service in India may be treated as service in the field.

Now the effect of this change would facilitate a decision which is needed, namely, not to send out any more soldiers' families. A soldier could not complain of his being separated from his family once in his life for five years. A ship is never commissioned for less than three years, and no women are allowed on board. But the necessity of the separation arises from the difficulty of sending with safety any large number of young children on a voyage to India, and for obvious reasons soldiers' children, are, as a rule, very young. In the nine ships despatched last year, the number of children under five years of age amounted to 29 per cent., while the general average in our population returns is only 13·10. The whole number of this age in these nine ships amounted to 1,061, and of that number as many as 341, or 32 per cent., died on the passage, but not from any mismanagement. On long voyages mortality amongst very young children is unavoidable. In 1852, in the Emigration Commissioners' Australian ships, the number of children was slightly increased by a relaxation of the rule excluding families with more than three under ten, so as to admit families with four under twelve. This slight alteration caused the per-cent-age of mortality to rise from 1·95 in 1851 to 4·94 in 1852. The following year, when this result became known, the former office rule was re-established, and the per-cent-age immediately fell to 1·66 in 1853, and to 1·59 in 1854, the latter low averages being calculated on 41,065 embarkations, while the former high one was only 34,095. With this experience of the emigration service, and a knowledge that during

* Vide Appendix III. p. 161.

the Mutiny there was very great mortality amongst the soldiers' children collected at Dum-Dum, the alternative seems to be, a short separation or Death. It cannot be doubted which ought to be adopted.

And here the Lecturer must strongly deprecate any attempt to colonise India by means of soldiers' families. If European colonisation in India be possible and desirable, on which subject the Lecturer offers no opinion, let it be done effectively, as in other colonies, by young couples and families unincumbered by young children. But on the score of humanity he protests against any such attempt with soldiers' families, as it must lead to the inevitable destruction of helpless children.

It may also be added, that, if service in India be treated as service in the field, then the force will lose the characteristics of a local corps, which it must inevitably acquire by a protracted service in a tropical climate, without the excitement of war, and with the present exchanging and volunteering.

Lastly, it remains to be shown that five years' service will not cause any additional expense for sea transport. By a plan which will be presently explained, ships may be chartered under one contract for the double voyage, out and home, at an average price of £25 a head.

In his pamphlet before referred to (p. 12) the Lecturer first made known his scheme, and mentioned £30 as the price at which their shipping could be secured. In the month of November last he reduced his estimate to £25.

An official inquiry lately instituted at the Emigration Office has resulted in a report,* which the Lecturer has been permitted to peruse, confirming the correctness of this later opinion; and, in support of Mr. Walcott's conclusions, it may be observed, that his calculations are made on existing prices ruling in a restricted market, and before the consolidation of offices, which, competing in the same business, unduly enhanced the price of all hired transports. Now, the average price during five years—1852-3 to 1856-7—paid under two separate contracts—one out and the other home—by the East India Company, was: outwards £14 10s., homewards £32 8s. or, together, £46 18s. a head; being £21 18s. a head in excess. On a comparison, therefore, of the working of the scheme with the sums already paid, as shown by a return† lately compiled at the India House, the result appears to be as follows:—

The gross cost of sea transport for all the Queen's troops, cavalry and infantry, drafts and invalids, for the five years above mentioned, was	£615,032
Or say in round numbers	615,000

At this period the average annual strength of the Queen's forces in India was 28,161, or say in round numbers 28,000. Consequently the average gross annual charge for transport, including regiments, drafts, invalids, &c. was £123,000.

The cost of relieving an army of the same numerical strength upon the proposed plan every five years, at £25 a head for the double voyage, would be as follows:—

* 27th March, 1860, S. Walcott, Esq., to Maj.-General Sir Alexander Tulloch, K.C.B.
† Vide Appendix, p. 160.

5,600, or one-fifth, outwards, at £12 10s. equal	£70,000
3,860, or three-fifths of above number, homewards, at £12 10s. equal	42,000
Total	£112,000

The number to be conveyed home is arrived at by assuming that, of the army sent out, two-fifths, or eight per cent. annually, would disappear, either by death, purchasing their discharges, or absorption in India. These casualties, it should be observed, are taken at much less than the present rate. It is hoped that by shorter service Indian casualties will be diminished.

On a comparison of the two systems for the same force, a saving on sea transport is shown in favour of the scheme of more than £11,000 annually. But the above comparison is made on the strength before the Mutiny. If made on a force of 80,000, then the result would be as follows:—

If 28,000 men cost £123,000, 80,000 at the same rate would give £351,428, or in round numbers	£350,000
Now, the transport for 16,000, or one-fifth of 80,000, outwards, at £12 10s. a head, would equal	£200,000
9,600 (or less two-fifths, or 8 per cent. per annum, of the number sent out) home- wards, at £12 10s. a head would equal	120,000
	320,000
Or an annual saving in round numbers (per annum for sea transport)	£30,000

Thus it is now established, on official authority, that an Indian Relief may be effected at £25 a head for sea transport, or less than the "levy-money" * of the cheapest description of recruit, and that for this service the East India Company has paid, on the average of a series of years, as much as £46 18s. a head.

Mr. Walcott's Report† and the India House Return‡ before referred to are the documents which authoritatively substantiate this statement.

This saving effectually disposes of any fiscal objection as regards the sea transport. Unfortunately, the Lecturer's experience being confined to the sea-board, he cannot give the particulars of the inland part of the operation. On this account it is necessary that he should anticipate the objection, that his plan will cost too much for land transport in India.

If this question, seriously affecting the health and efficiency of the British Army and the lives of soldiers' families, is to be submitted to the calculations of an accountant, and the decision made to depend on his report,

* "Levy-money" per man:—	£	s.	d.
Infantry of the Line	31	13	11
Royal Artillery—Field Batteries	50	5	0
Horse Artillery	73	8	9
Royal Engineers	84	2	5

+ 27th March, 1860, S. Walcott, Esq., to Maj.-General Sir Alexander Tulloch, K.C.B.

‡ Appendix, p. 160.

then there may be claimed as a set-off for this land transport objection a credit—

1. Of £100 per man for every diminished casualty.
2. Of the sums to be paid for moving up country the 10,000 rank and file drafts now under orders for India.
3. Of the like sums for moving down country a corresponding number—less deaths and volunteers—of invalids and time-expired men coming home to be discharged.
4. Of the saving of passage money by not sending out soldiers' families; and,

Lastly, of a good round sum by the suppression of dépôt battalions.

When that account is made up, it will probably show a sufficient balance in favour of the Lecturer's scheme, and a result as satisfactory to himself as the recent inquiry at the Emigration Office into the accuracy of his statement, that Indian shipping could be engaged at £25 a head for the double voyage.

One objection to the plan may very fairly be urged,—namely, the difficulty of engaging in England to embark on the return passage any given number of men. But to this objection it may be observed, that the ships proceed by the Cape, while the letter of advice goes overland—that communications by telegrams and railways, as they are proceeded with, will facilitate the service,—and that charters may be carefully framed to meet any inordinate loss on men short-shipped in India.

Before proceeding to the next division of the subject, it is necessary to refer once more to the paper prepared by an Officer of Rank, recommending an alteration in the infantry organization. On this point, which, as it regards the possibility of expediting Reliefs, is a material one, the Lecturer offers no opinion of his own: nevertheless he must insist that it is not possible to transport men effectively and economically, unless they are under the control of one authority, and in bodies regularly organized. Without intruding his own opinions on a professional point, he may, perhaps, be permitted to express a doubt whether drafts would ever fulfil these necessary conditions.

He would also draw attention to the forcible arguments in the paper just referred to, and which coming from such high authority must carry great weight in favour of creating additional battalions.

In quitting this subject the only remark that will be added is, that, if in the proper department it should be considered that the regulation one-third Home and two-thirds Foreign Service can be worked most effectively by regiments of three battalions, then it would seem that such regiments as already possess twenty-four companies may be forthwith reorganised and raised to regiments with three effective battalions, without any additional expense to the country.

IV.—EVILS RESULTING FROM A DEFECTIVE ORGANIZATION OF THE TRANSPORT SERVICE.

In the month of March, 1859, the Lecturer published his views on this subject. He remarked that—

“At present there are two public departments doing the same business

and competing in the same market. Any one acquainted with the business of taking up shipping by public tender knows the advantage of being able sometimes to decline all tenders without the risk of losing a desirable ship by its charter to another public department."

He also observed that—

"Another advantage derivable from a concentration of authority is, that any improvement connected with health, dietary, fittings, or other details which experience may recommend, could at once be adopted by the War Minister, instead of first being subject for discussion between two separate departments, as will probably now occur on any important alteration in the transport service. But to perfect a transport system constant changes will occur, as the experience of several voyages, if carefully watched, suggests improvements; and these, if another department has first to be consulted, may not be so readily adopted.

"The chief benefit, however, expected from such concentration, is the possibility of placing in the same hands the control over the troops to be conveyed, and the ships chartered for their conveyance. At present there is a divided authority between separate departments—the Quartermaster-General's Office and the Admiralty, or, if the troops are destined for India, the new Council. But for the successful movement of bodies of people by sea as well as on land, an undivided authority over the whole operation is indispensable. A divided authority increases uncertainty; and, as every uncertain contingency has to be provided against in the charter, the shipowner is sure to charge for it as a certainty.

"Again, unless the same department which controls the men also engages the ship, and is made liable for her detention if kept waiting for men, or for an alteration of the fittings when too many or too few of a class come forward for embarkation, there is no security that careful previous arrangements will be made; and, when any miscarriage does take place, each department blames the other, and so both escape censure. Moreover, by a concentration of authority, and the military authorities having the entire control over the transports, there would be less risk of troops on the eve of foreign service being harassed unnecessarily and kept under orders to sail longer than is absolutely necessary.

"It is believed that in the general arrangements of the transport service very great improvements have of late years taken place; but, nevertheless, orders and counter-orders, as to both the time and place of embarkation, not unfrequently do occur.

"Now, it is very desirable that men on the eve of long foreign service should not be harassed unnecessarily; and by proper arrangements the time of sailing may generally be known with certainty a month beforehand, when the ship is taken up. But if when the shipping, as at present, is not under military control, men are, from the fear of being too late, refused furloughs, and unable to take leave of their friends, and afterwards are long kept waiting for their ship, they embark discontented; and, as the British Army has to be recruited by voluntary enlistment, everything which tends to make the service unpopular ought, if possible, to be avoided."

To these general views, the result of experience derived from an analogous service, the Lecturer adheres. But they have recently received

confirmation by the authority of a medical officer, who states that he has made nine voyages in charge of troops. At the time the Lecturer's pamphlet appeared in England, Doctor Kirwan, late Assistant-surgeon of H. M. 13th Light Infantry, wholly unknown to the Lecturer, and, as he has ascertained, now filling a staff situation in India, published at Calcutta, from "journals carefully kept during nine voyages," his views on sea transport. Without subscribing to all Doctor Kirwan's opinions, his suggestions on many details will be found to be very valuable.* To the authority of Doctor Kirwan the Lecturer would confidently refer in confirmation of his published opinions on the evils resulting from the arrangements for the despatch of troops being distributed over so many departments, and he entirely subscribes to this officer's remark, that "sea transport would be conducted more simply, economically, and efficiently, by having the whole business entrusted to one department especially appointed and educated for that purpose."

The foregoing remarks have reference chiefly to transport for ordinary reliefs in time of peace. But for the most part they would equally apply in time of war. During the three years of the Russian war, the transport votes exceeded fifteen millions sterling; and it is notorious, that of this large outlay much was expended unnecessarily. The average cost of sailing vessels—which the Admiralty hired the first year by the month and not by the voyage, was £1 7s. 7½d. per ton. The Transport Board the following year knocked down the average price to 15s. 10½d. per ton; and, as the original mistake was committed of sending men by steamers and horses by sailing vessels, instead of reversing the operation, much of the large outlay in the first year on steamers was thrown away, as without horses the Army could not take the field. The Himalaya did not reach Varna, on her first voyage with horses, until the 12th of June; while this vessel, with the Ripon, Manilla, and Orinoco, had sailed from England with the Guards, and other infantry regiments, in the month of February.

It is the Lecturer's opinion, that in time of war recourse must be had for the most part to the transports of the merchant service; and that by the aid of this service, if properly directed, our military power may be enormously increased. Now, as a class, shipowners are remarkable for their intelligence; and being necessarily exposed to great competition they must, in protection of their own interests, make for themselves the best bargains they can. For the interests of the public, it is essential that any department engaged in chartering ships should be thoroughly acquainted with this description of business; and it may be regretted that at the close of the Russian war the Transport Board was suppressed. But it is believed that the then First Lord was very desious of preserving the experience of the Board; and it is only just to Mr. Giffard of the Admiralty, the late able Secretary, to mention, that great credit is due to him for the pains which he is known to have taken to improve this branch of the service, and to preserve, as a record for future use, much valuable information which the Board had acquired.

* For extracts from this useful and timely publication, vide Appendix IV. p. 164.

V.—ORGANIZATION RECOMMENDED FOR THE TRANSPORT SERVICE.

The outline of the plan which the Lecturer would recommend is given at page 24 of his pamphlet. It may here be briefly recapitulated as follows:—

1. To consolidate the transport business under a Royal Commission to be issued by the War Minister.
2. The Commission to consist of the Quartermaster General, as president, his deputy, and two Civil Commissioners, of whom one may act as secretary.
3. The Civil Commissioners to be responsible for the engagement of shipping, and the appointment of proper officers to survey and despatch vessels.
4. Financial details to be settled by the Treasury with reference to analogous services performed by the Council of India and the Emigration Commission.
5. The Board to employ exclusively vessels hired from the merchant service of a suitable size, so that two would always carry a battalion. As a general rule, ordinary Reliefs to be effected to and from England direct. This mode of relief, which will bring home regiments more frequently, will be found to facilitate the engagement of cheap transport, as there is a home but not an inter-colonial trade; and every cheap troop-ship must carry cargo as well as passengers., and will be chartered most advantageously for the double voyage out and home.

The reasons for this form of charter will be found at pages 11 and 14 of his pamphlet.* As before stated, the sum of £25 may be relied on as the fair average price per head of an Indian Relief; and it is impossible that it can be effected for less by vessels belonging to Government. For the reasons against the employment of ordinary Reliefs by Government transports the Lecturer would refer to a memorandum in the Appendix to his pamphlet.

6. Any steam transports which, against the exigencies of war, it may be thought advisable to retain or to construct afresh on new principles, should be under the exclusive control of the Admiralty. But it is believed that even in war the steam fleet of the merchant service will be found equal if not superior to any transports which on an emergency could be turned out of Government yards.

It may be observed, that, for the safe and quick passage of troop-ships, they ought not, except under great restrictions as to quantity and stowage, to carry military stores; and that, if transports be hired, such restrictions would generally be found to make it cheaper to send their stores by vessels chartered expressly for this conveyance. Such vessels would

* Vide Extracts, Appendix I. p. 157.

not be subject to many conditions which are only imposed on ships carrying passengers and not cargo.

For this reason, if it could be so arranged, it would be far better for the troops not to disturb the present arrangements for the conveyance of military stores.

7. The vessels chartered for the conveyance of troops to be despatched from certain despatching ports, so selected as to facilitate the engagement on the most advantageous terms of any shipping that may be available at the time, in the principal ports of the United Kingdom. Three such ports, one in the Mersey, another in the Channel, and a third in Ireland, would suffice.

At these despatching ports, baggage warehouses, and facilities for embarking and disembarking troops without exposure to wet, to be under the control of the Quarter-master-General's local officers.

Without going into unnecessary details, the above is an outline of the scheme which the Lecturer would recommend for the military transport service. In submitting it as the result of the best opinion which he can form upon the subject, he can only repeat the observations which were originally appended to it. They are as follows:

"The main point on which he insists, as essential to the efficiency of any transport system, is to attach to the military authorities the responsibility of moving troops by sea as well as on land.

"At the same time he feels that, to many persons, it may seem hazardous to remove from the Admiralty the superintendence of a service which concerns the lives of troops. And he readily admits one advantage attached to the present system, namely, that the decisions of the Admiralty—the highest naval authority in the realm—carry a weight which, when inevitable accidents do occur, opposes a powerful resistance to the undue pressure of public opinion. For it must be borne in mind that by no human efforts can the perils of the sea be always successfully resisted.

"On the other hand, it is believed that Admiralty regulations, framed carefully, but still somewhat with reference either to long usage or the rules of the Queen's service, do not admit of the engagement of merchant ships on the best terms; and that a separate Board, responsible for its own management, and able to deal promptly with shipowners and their brokers, will obtain far better terms than an office, the operations of which must necessarily be under the control of a superior department. Moreover, as a proof that the sea transport of troops may safely be intrusted to a Board presided over by the Quartermaster-General, and subordinate to the War Minister, and with a marine department composed exclusively of civilians, the lecturer would confidently refer to the operations of the East India Company and the Emigration Commission, which latter department has to deal with undisciplined people, including women and children, far more difficult to manage than disciplined troops; and he is confident that such a transport office as above suggested could be organized with perfect safety and every probability of success."

CONCLUSION.

It only remains to recapitulate the principal points of the lecture. They are as follows:—

1. The severity of the Colonial service, as shown by the cited cases.
2. The claim of the Army to a frugal use of all money voted for military transport.
3. The waste in employing for ordinary reliefs steam troop-ships.
4. The exhaustion of recruiting resources by the casualties of the Indian Army.
5. The difficulty of keeping up this force unless its casualties are diminished.
6. The mortality amongst soldiers' families on the voyage to India.
7. Advantages, as regards the health and efficiency of the whole British army, and the preservation of life, by reducing Indian service to "five years" as the maximum.
8. Explanation of the process by which this change of system may be effected, without any additional expense for sea transport.
9. Necessity of additional battalions.
10. The present defective organization of the transport service, and evils resulting therefrom in peace and war.
11. The expediency of organising, in connection with the Quarter-master-General's Department, a transport office, responsible to the War Minister.
12. This office to employ, for ordinary reliefs, transports hired from the merchant service; and, as a general rule, the reliefs to be effected from England direct.

The above brief summary will serve to recall attention to the principal points of the lecture, which it is hoped, considering the importance of the subject, will not be thought of inordinate length.

Without any wish to create unnecessary alarm or undue excitement, but, at the same time, with a very strong conviction of the importance of the subject, and also of the difficulty of accomplishing the extensive changes considered necessary to remedy existing evils, it is submitted that the Lecturer may reasonably entertain a desire that the foregoing remarks should be pressed on the attention of the Imperial Government, the Indian Council, and those influential philanthropists who take soldiers' families under their special care and protection, and whose benevolent exertions will—when the proposed measures are carried into effect—become more than ever valuable.

Lastly, if Her Majesty's Government, convinced—through the instrumentality of this Institution—that a case for inquiry has been made out, should decide upon tendering advice to that effect to the highest authority in the realm, it is humbly conceived that the intense interest and earnest solicitude which the Sovereign is known to entertain for the welfare of Her army, would probably induce Her Majesty graciously to yield a ready assent to a measure calculated to improve its efficiency and social condition.

APPENDIX I.

Extracts from the pamphlet,* "Military Transport by Sea," showing the advantage, in working Reliefs, of chartering ships for the double voyage:—

"The cost of a soldier's passage to India in 1855-6, and the early part of 1857 (before the extent of the mutiny became known), was under £10 10s. per head, medicines and medical comforts included; and, as the victualling comes to about £7, the actual cost of passage was very little over £3.

"That sea transport to India should be procurable on such low terms is at first inconceivable; it is, however, a fact, and one well worthy of consideration by those who advocate the Overland route, or the employment of steamers belonging either to a subsidized Company or to the trade at large. It admits of the following explanation:—The East India Company have very properly so framed their charters, as to admit on board the ships which they engage for troops the easy shipment, in addition, of ordinary cargo. This is the true principle of getting cheap passenger ships. Some articles of course are prohibited, and all cargo conveyed in ships carrying troops, or ordinary passengers, should be stowed under inspection, both to prevent excess either of quality or quantity, and to secure its proper stowage, especially when iron and like heavy articles are in question.

"The effect of the Company's mode of hiring transports is thus explained by an eminent London broker, consulted by the writer on many details connected with the Transport Service, and to whom he feels much indebted. He says:—'Ships trading to India can get dead weight, such as metals, beer, and heavy Manchester goods, &c.; but cannot get sufficient light measurement goods to fill their lofty and spacious between-decks. It therefore answers to take troops at a small remunerative price, as better than nothing or next to nothing; and it enables them to leave out a portion of the heavy articles which otherwise they would have to take, lightening the ship and enabling her to make a quick instead of a slow passage, and thus to save in wear and tear, wages, and provisions.' The late discoveries in the use of distilled sea-water may further facilitate the carriage of goods in troop ships.

"It is however in the passage to India that the very low freights prevail; and, although the writer does not possess returns showing the average cost of a homeward passage, still he believes it to be more than double that of the passage outwards. It is hoped to remedy this defect by the plan hereafter explained, and to reduce the cost of passage, out and home, below £30, or less than the charge for an infantry recruit; but it may be useful first to quote the opinion of the late Committee relative to the use of the overland route, as a great deal of valuable evidence was taken on that point. It is as follows:—'That, although the overland route may be advantageously employed in times of emergency, it would not be advisable

* Published, March 1859, by William Clowes and Sons, Charing Cross.

that it should be relied upon as the ordinary route for the transmission of troops to India.' In this view the writer entirely concurs.

" In the Conclusion the writer has given his reasons against Government contracting with a public company to undertake the whole Indian Transport Service—a proposal which has been made ; and in a separate memorandum annexed, supplied by the same experienced person before mentioned, to which he would draw particular attention, will be found the arguments in favour of transporting troops by hired rather than Queen's ships. At the same time he admits the advantage of keeping a limited number of steam transports, *to be commissioned if required*, and of occasionally employing the fleet, as in the Russian war, to assist in transporting an army.

" The plan which has occurred to the writer as most likely to reduce the cost of passage, is that of chartering ships for the double voyage, out and home. It has already been explained, that, to obtain cheap sea passages, the ship must carry goods as well as passengers. Now, between this country and all its possessions abroad, there is already a trade ; but there is very little intercolonial trade. If, therefore, a transport be chartered for the double voyage, out and home direct, and not to an intermediate colony, the ship both ways will have a chance of ordinary cargo, and on this account, independently of other savings, will be obtainable at a lower price. The effect of the system will be, to send the relieved regiments direct to England, and their return home, consequently, would be much more frequent. Of course this could not apply to regiments located in the same group of colonies, and whose stations it might be desirable to change.

" As regards India, it has already been stated, that the cost of the passage homeward is at least double that of the outward passage, which before the mutiny averaged much less than £15 ; and it is in the former that a saving is anticipated, from the adoption of the double charter. The broker before mentioned gives his opinion of the plan for India in the following words :—

" ' There would be more extended competition.

" ' Owners prefer a certainty, to sending their ships to seek homeward freights, which fluctuate very much.

" ' They would lay in here the most costly of the provisions on cheaper terms than in India, and always, but more especially in case of a quick run out, save their surplus stores ; while the water-casks, cooking apparatus, and other fittings, being already on board, these would materially lessen the expense, as compared with the cost of taking up in India a fresh ship unprovided with these fittings. With proper arrangements, aided by the overland communication for the Reliefs, there would be no difficulty in adjusting the outward and homeward demands for tonnage, and the vessels might be taken up in a similar manner to the Coolie ships chartered by the Emigration Commissioners—namely, to be placed at the disposal of the local government on a given day (say five or six weeks after the date of arrival), fitted, provisioned, and ready for the reception of troops, their dead-weight of cargo being previously on board and stowed away.'

" The only difficulty which attends the double charter, is insuring the relieved regiments being free to be brought away, and avoiding the

liability to pay for men who may not be carried. But the overland communication materially helps the arrangement, and this detail could be provided for in a charter carefully framed, with only a moderate loss to Government when troops intended to be relieved cannot be spared for embarkation by the local authorities."

MILITARY TRANSPORT BY SEA,

APPENDIX II.

RETURN showing the EXPENSE incurred on account of TROOPS and INVALIDS of HER MAJESTY's and COMPANY's SERVICES proceeding to and returning from INDIA from 1852-53 to 1856-57.

TROOPS OF HER MAJESTY'S SERVICE OUTWARD.						RECRUITS OF COMPANY'S SERVICE OUTWARD.						TROOPS OF HER MAJESTY'S SERVICE HOMeward.						INVALIDS HOMeward.						REGIMENTS.											
REGIMENTS.			DRAFFTS.			TOTAL.			REGIMENTS.			DRAFFTS.			TOTAL.			REGIMENTS.			DRAFFTS.			TOTAL.			REGIMENTS.			DRAFFTS.			TOTAL.		
No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.	No.	£	s.	d.				
1852-53	—	—	—	2,194	26,198	15	9	26,198	15	9	1,167	15,943	16	3	95	2,097	14	0	1,059	22,308	7	0	175	3,860	15	0	—	—	—	—					
1853-54	57,081	13	6	2,911	35,147	9	3	92,229	2	9	2,822	46,067	19	3	581	14,510	1	0	1,449	37,427	16	0	174	3,925	0	0	—	—	—	—					
1854-55	33,014	19	5	1,294	22,293	19	4	55,208	18	9	1,863	29,030	10	3	3,314	113,808	14	0	975 ^t	29,574	11	0	257	9,503	0	0	—	—	—	—					
1855-56*	310	3,761	15	2	1,362	18,958	0	10	22,744	16	0	1,350	15,190	18	0	3,037	116,709	12	9	847	33,690	9	9	126	8,949	10	0	—	—	—	—				
1856-57	1,447	13,489	8	8	1,925	9,555	1	1	23,044	9	9	1,661	17,481	17	6	105	2,896	10	0	766	22,153	1	9	247	6,286	0	6	—	—	—	—				
	6,806	107,372	16	9	7,986	112,153	6	3	219,536	3	0	8,863	123,715	1	3	7,132	249,932	11	9	5,100	145,554	5	6	979	32,524	5	6	—	—	—	—				
Cost per head	£15 15s. 6d.				£14 0s. 11d.				£14 16s. 10d.				£13 19s. 2d.				£35 0s. 11d.				£28 10s. 10d.				£33 4s. 6d.										

* Part of a Regiment.

NOTE.—The Totals and "Cost per Head" have been added to the India Office Return.

APPENDIX III.

EXTRACTS from REPORTS of Sir A. TULLOCH and Doctor HENRY MARSHALL, on MILITARY STATISTICS.

West Indies.

Combining then all the information we have been able to collect on the subject, in regard to both the West India commands, we are led to the following conclusions:—

1. That troops are likely to gain but little immunity from either disease or mortality by a prolonged residence in the West Indies.
2. That soldiers are not in general liable to any greater mortality during their first year of service than at any subsequent period.
3. That when circumstances attending the mortality in several corps, during their first year of residence in Jamaica, are minutely investigated, the facts apparently at variance with the above conclusions are sufficiently explained by the occurrence of *four epidemics*, from 1819 to 1827, so that no corps could arrive without encountering their fatal effects within the first year or two of its residence there.
4. That, though in years of ordinary mortality corps long resident in the island suffer as much or even more than those recently arrived, yet during the ravages of *epidemics* there appears a partial exemption in favour of the former.

This peculiarity may, however, be easily accounted for, without attributing it to so indefinite a cause, or one so little supported by numerical results, as the supposed influence of "*acclimatization*." All the medical reports concur in stating how much the susceptibility to fever is increased by fear and despondency, and these passions we may easily conceive operate much more powerfully on the minds of men newly arrived in the country than upon those who have encountered and survived similar epidemics before. We may easily imagine what may be the feelings of a recruit when he sees the fourth part of his comrades swept off in the space of a month, as was the case in some corps soon after their arrival. We can suppose the apprehension with which he will contemplate the probability of a similar fate, and how little expectation he will entertain of being among the fortunate survivors. He is thus not only rendered more susceptible of the influence of disease, but goes into hospital with scarce a hope of recovery; whereas the soldier who has been long accustomed to the mortality of the country possesses not merely the advantage of being less apprehensive, and consequently less susceptible, but even if seized with fever will keep up his spirits, and contend against the violence of an attack under which the other would sink.

We may mention as a remarkable instance of the influence of *fear* in inducing this disease, as well as of *hope* in repelling it, that, during the epidemic at Up Park Camp amongst the 91st regiment in 1822, when the order was issued for their removal to another station the fever ceased, and though the corps was unexpectedly detained for three or four days after the •

order was issued, not one single case was admitted into hospital in the whole course of that period.

In Jamaica the annual mortality among those resident one year only was 77, and of those two years 87 per thousand, whereas the mortality of those longer in the island averaged 93 per thousand.

Mauritius.

AGES.	Annual ratio of mortality per 1000.		Excess of mortality at each age in Mauritius.
	Mauritius.	Cavalry, U. K.	
18 to 25	20·8	13·9	6·9
25 „ 35	37·5	14·0	23·5
33 „ 40	52·7	17·3	35·4
40 „ 50	86·6	26·7	59·9

The deterioration of constitution with the advance of age in the Mauritius, as shown by these results, must have been extremely rapid. To exhibit its operation in this respect more clearly, we have brought into comparison the progressive increase of mortality at the same ages among the Dragoon Guards and Dragoons serving in the United Kingdom, from which it appears, that, though between the ages of 18 and 25 the ratio is not 7 per thousand higher than in this country, that difference increases between the ages of 40 and 50 to nearly 60 per thousand. Consequently residence in this colony seems to affect the oldest at least eight times as much as the youngest class of soldiers,—a very remarkable proportion indeed, even within the tropics.

Whether this rapid deterioration of life is the result of the soldier's own intemperance or of the influence of climate, it seems equally necessary, as a remedial measure, to limit as much as possible the period of his residence in this island.

Ceylon.

	Under 18.	18 to 25	25 to 33	33 to 40	40 to 50
Died annually per 1,000 of mean strength } 28 ³ / ₁₀ .		24	55	86	120

This exhibits the same remarkable increase of mortality at the more advanced periods of life as has been observed in the West Indies and Mauritius.

As those who have been longest in the climate are generally to be found amongst the oldest soldiers, it would appear also to follow from these results that the mortality must increase with length of residence in a corresponding proportion; but that this important conclusion may not rest on doubtful evidence, the deaths which have taken place during the first and second year of residence, among all the recruits who joined from 1830 to 1836 inclusive, have been carefully noted . . . Thus the mortality which was only 44 per 1000 in the first year, increased the second to 48, and among those whose residence exceeded two years to 49 per 1000.

Bengal.

Civil Servants.

	Numbers Alive.	Deaths First Year.	Ratio of Deaths per 1,000 of Living.
1st year of residence . . .	975	19	19·5
2nd ditto	938	22	23·5
3rd ditto	906	18	20·0
4th ditto	874	19	22·0

Here then we have traced the same individuals through four successive years of residence, with the liability to mortality constantly increasing, and, unless we are to suppose that a different law regulates the mortality of Europeans in the tropical climates of the eastern and western hemispheres, we are invariably led to the conclusion already demonstrated from the previous results.

[In the Report of 1838, p. 86, the following remark explains the diminution of deaths among civil servants after the 10th year, which was shown in one return to have occurred.]

Between 10 and 15 years' service is the period when leave of absence is allowed to those who choose to return to Europe for 3 years, which of course must have a material tendency in reducing the mortality of that class.

[In the Report of 1841, p. 50, referring to the danger of drawing general conclusions from a few regiments, the following remark occurs:—]

In such matters conclusions can only be drawn with safety from the experience of a number of corps, extended over a series of years; and nothing is more apt to lead to error than to assume the events which have occurred in one as a criterion for estimating the influence of climate on the whole.

APPENDIX IV.

EXTRACT FROM NOTES ON "THE DISPATCH OF TROOPS BY SEA."* By Charles J. Kirwan, Esq., late Assistant Surgeon H. M. 13th (Prince Albert's) Light Infantry.

"THESE notes, which form some portion of the results of journals carefully kept during nine voyages with troops, are submitted with the anxious wish that attention may be drawn towards the manner in which our troops are sent to sea. Nothing but the conviction that an immense amount of destruction of the property of the soldier, and permanent loss of health (not to speak of the temporary discomfort), result from the imperfect fittings of the ships employed, and the defective arrangements made for the government and discipline of the men when on board, would have induced the writer to introduce a production which he is painfully conscious is full of imperfections. But voyage after voyage and year after year the same subjects for regret have forced themselves on his notice—no endeavour to improve the state of matters has become apparent to him—and no one has taken up the pen either to point out existing defects, or to suggest remedies for them.

Transport service administration submitted to revision.

"The subject of the Sea Transport of troops is gaining such daily increased importance, that it demands that the greatest consideration should be bestowed on every point connected with it. The remarks contained in the preceding pages have been principally concerned with throwing out a few somewhat disconnected hints calculated for the improvement of details. In what follows, it is proposed to glance at the present system of the administration of the Transport 'Service,' with a view to the suggestion of some method for its improvement.

Different departments engaged in transport service.

"It appears that there are at present no less than three Departments directly connected with the despatch of troops by sea, the Admiralty, the Quartermaster-General with the Commandant at the port of embarkation, and the Council for India. There are also different schemes of victualling provided for the troops, according as their destination may be India or any of the other possessions abroad.

Different scales of rations for Her Majesty's troops.

"Leaving out of sight the apparent anomaly of having *different scales of rations*, it may be worth while inquiring whether any good purpose is served by having the despatch of troops scattered over so many Departments, and whether it might not be conducted more *simply, economically, and efficiently* by having the whole business entrusted to *one Department especially appointed and educated for that purpose*.

* Published at Calcutta, 4th May, 1859, and sold by W. Thacker & Co., Newgate-street, London.

"Under the present arrangement, it will scarcely be denied A better system that *many ships of an inferior class are sent to sea with troops.* The frequency with which accounts appear in the public prints of troop-ships putting back owing to stress of weather, and the equal or even greater frequency with which they are under the necessity of calling at intermediate ports during their voyage, for the purpose of taking in supplies, seem to indicate that they must have been ill found in the matter of spar and cordage, and that by some means or other they have managed to leave port without a sufficient quantity of provisions.

"Without for a single moment thinking to impute the slightest A responsible approach to dilatoriness in the discharge of the public business head necessary to any one of the Departments concerned, *it cannot cease to be* for despatch. *a matter of regret that such things should occur.* Indeed, considering the circumstances under which they must undertake the duty, rather as a matter extraneous to their usual course of business than as a part of regular duty, it is a matter of surprise that the transport service has not been even more unfortunate.

"Under the present somewhat complicated system, there is An officer with some difficulty in fixing the Department to which to address whom to cor- any communications on subjects connected with the transport respond. service, a state of matters which might occasion delays highly prejudicial to the public interest.

"The duties required in the chartering and superintending Making the the fitting up of troop-ships are such as to require a *special* transport ser- education added to a knowledge of the requirements of troops. It cannot be fairly supposed that the Admiralty can have a very correct knowledge of, or take a very lively interest in, all the requirements of the soldier, and so cannot be expected to make all the necessary arrangements for his accommodation at sea. The East India House,—however able they may formerly have been to superintend the despatch of troops when only a limited number were required, and when all the transport in that direction was seldom more than the quiet relief of a regiment which had completed its period of Indian service,—now, when the greater part of the available force of the British Army is being poured into its late dominions, can scarcely be expected with the limited staff at its disposal to be equal to the emergency. The department of the Quarter-master-General again, while it may be able to decide most judiciously on everything connected with its more especial duties, must feel that it forms a drag of no inconsiderable magnitude upon their efficient performance, to be called on to provide for and superintend all the details of the embarking and disembarking of such a large number of troops, as annually leave and return to the British shores.

"Independently of the vast amount of almost extraneous labour which the transport service entails upon the department, The safe and expeditious despatch of

troops by sea is it cannot be expected that, composed as it is of military men, now so important that its close study should be encouraged.

"While it is only proper that all matters affecting the comfort or efficiency of the soldier should be under military surveillance, still it is proper that the management of details should be left to a class of officers *thoroughly acquainted with their nature.*

"It seems also to be a matter urgently demanding consideration that these officers should be so placed in relation to each other, and to the officer charged with the superintendence of the whole matter, that there shall be no risk of inharmonious working, and *no delays originating from one department requiring to wait for another.*

A new branch of the public service proposed.

"Some such considerations as these seem to suggest the necessity of establishing a *new branch of the public service, having for its duties the superintending of all details connected with the embarking and disembarking troops, to whatever part of the globe they may be about to proceed.*

Simplicity.

"The arguments in favour of the establishment of such a department distinct from any of the other public offices of the country, are various and weighty. The whole working of the transport service would be simplified. All the business connected with it would be performed in one office, and under one management, so that errors and abuses would be less likely to creep in than when several departments did an independent share of the duty.

Celerity.

"The celerity with which the business of the department would be conducted forms a powerful argument in favour of its establishment. It is unreasonable to suppose that any matter can be conducted to a successful issue, or without frequent and annoying delays, when there are two independent parties engaged in its performance. Neither of them are willing to consider that the onus of the matter rests with it, and so frequent delays occur from one department requiring to wait for another.

Better security.

"But the principal argument in favour of such a department rests in the additional security which the Government would have, that ships of a proper class were taken up, that they put out to sea in good condition and well found in sea-stores and provisions, and generally that all the conditions of a well-conducted charter-party had been fully carried out."

APPENDIX V.

PARTICULARS OF MORTALITY in the Ships conveying SOLDIERS' WIVES and CHILDREN to INDIA, of which official accounts have yet been received.

Thirteen ships were originally taken up for the conveyance of 5,410 souls. We have received intelligence of the arrival in India of nine of these ships, which carried 3,747 souls. In these the mortality was 377, equal to 10 per cent. But this mortality was almost exclusively among children under 5 years old. Of adults (that is, all above 12) there died 11 out of 1,820 = .60 per cent. Of children between 12 and 5 inclusive, 24 out of 866 = 2.77 per cent. making out of all above 4 years of age, 35 out of 2,686 = 1.30 per cent. This is rather less than the whole mortality in Australian emigration (1.32 per cent.), and considering the class of women, the time (nearly four months) occupied by the journey, and the double passage through the tropics, it must be allowed to be very small. But among children under 5 the mortality amounted to 341 out of 1,061 = 32 per cent. The principal diseases were measles and scarlet fever, which broke out in almost every ship shortly after sailing. These diseases were, no doubt, aggravated by the debilitated state of both children and mothers, caused by the unusually stormy weather which prevailed in October and November last, when the ships sailed. It is to be observed, moreover, that the children under 5 years of age in these nine ships amounted to nearly 29 per cent. the average in the population generally being 13.10. This disproportion necessarily assisted the spread of disease and increased the mortality.

EMIGRATION OF SOLDIERS' FAMILIES.

TABLE showing the NUMBERS who would have OBTAINED, and those who would have been REFUSED, PASSAGES if there had been applied to them the EMIGRATION COMMISSIONERS' REGULATION, which excludes families with more than 2 children under 7, or than 3 under 10 years of age.

NAME OF SHIP.	ELIGIBLE PEOPLE.		INELIGIBLE PEOPLE.	
	Women.	Children under 12.	Women.	Children under 12.
Monica	223	262	15	63
Vortigern	168	182	7	24
Statesman	152	194	6	23
Taymouth Castle	128	169	8	31
Acerington	225	244	7	30
Clara	114	90	5	21
Cossipore	166	182	8	30
Clifton Belle	207	189	9	33
Dudbrook	132	143	3	10
Lancashire Witch	207	256	12	48
Euxine	201	212	9	35
Emma Colvin	127	125	6	21
Lord Dalhousie	152	191	5	17
Total	2,202	2,439	100	386

It will be observed that the number of children returned as eligible is greatly more than in a Government emigration ship, owing to the absence of the husbands and of single men or women. The absence of the husbands no doubt threw great additional labour on their wives in cases of sickness.

Memorandum.

Previously to 1852 the rule of the Emigration Commissioners was to exclude from their emigrant ships to Australia, on sanitary grounds, all families which included more than three children under ten years of age; but they were reluctantly induced, in December 1851, by outward pressure, to relax the rule, so far as to admit families with four children under twelve, and, although this relaxation did not come fully into operation before April 1852, the effect of it was to more than double the average mortality of former years. Immediately on the restriction being again imposed, the mortality fell to rather below its former rate. This is shown in the following Table, where the rate of mortality amongst the total number of emigrants *embarked* in 1852 (when the rule was relaxed), is 4·90 per cent., while in the two previous and in the two succeeding years it was much less than half that rate. It may be added, that subsequent improvements (of which the soldiers' families had the full benefit) in the diet of the young children, and in the fitting up of the ships, have now reduced the mortality in the Commissioners' Australian emigrant ships to 1·32 per cent., which is but little more than one-fourth of the mortality in 1852.

MORTALITY in EMIGRATION conducted by EMIGRATION COMMISSIONERS during the years 1850, 1851, 1852, 1853, and 1854.

YEAR.	EMIGRANTS EMBARDED.			DEATHS.			PER-CENTAGE OF MORTALITY.			INFANTS BORN ON THE VOYAGE.			PER-CENTAGE OF MOR-TALITY.		
	Adults (14 years and upwards)	Children (1 to 14)	Infants	Total	Adults (14 years and upwards)	Children (1 to 14)	Infants	Total	Adults (14 years and upwards)	Children (1 to 14)	Infants	Total			
1850	6,044	1,646	213	7,903	62	77	28	167	1·02	467	13·14	2·11	1·02	18	17·64
1851	9,007	2,356	330	11,693	79	99	51	229	.87	420	15·45	1·95	158	18	11·39
Year in which proportion of children was increased	22,084	10,694	1,317	34,095	365	977	343	1,685	1·65	913	26·04	4·94	731	145	19·83
1853	20,455	6,514	754	27,723	127	241	94	462	.62	369	12·46	1·66	452	71	15·70
1854	30,372	9,515	1,178	41,065	150	354	161	655	.49	372	12·81	1·59	649	69	10·63

Evening Meeting.

Monday, May 7th, 1860.

Captain E. G. FISHBOURNE, R.N., C.B., in the Chair.

The Chairman announced that Nine Members had joined the Institution since the 30th April.

Paterson, E. T. L., Capt. 63rd Regt.	Atkinson, Thos., Ens. 63rd Regt.
Clutterbuck, G. W., Lieut. 63rd Regt.	Scovell, T., Ens. 63rd Regt.
Crowther, R. M. B., Lieut. 63rd Regt.	Leather, Jno. T., Capt. 2 Dorset Art. Volrs.
Boyd, Jas. P., Lieut. 63rd Regt.	Clarke, John, Assist. Surg., 95th Regt.
Smyth, Jas. S., Ens. 63rd Regt.	

PRESENTS.

LIBRARY.

Books.

Ellis, C. B. E., Lieut. R.A.—Military Notes, written at Secunderabad, India. No. II. Large 8vo.	<i>Presented by the Author.</i>
Royal Artillery Institution.—Occasional papers of. Vol. I. No. 21.	<i>Presented by the Institution.</i>
Royal Society of Edinburgh.—Transactions of the Society, Vol. XXII., Part I., for the Sessions 1857-8. 4to. Proceedings of the Society, Session 1858-59. 8vo.	<i>Presented by the Society.</i>
Royal Society.—Proceedings of. Vol. X. No. 38.	<i>Presented by the Society.</i>

MUSEUM.

Military.

Model of Captain Grant's Apparatus for Cooking for Troops in the Field. Complete.
Presented by Captain J. Grant, late R.A.

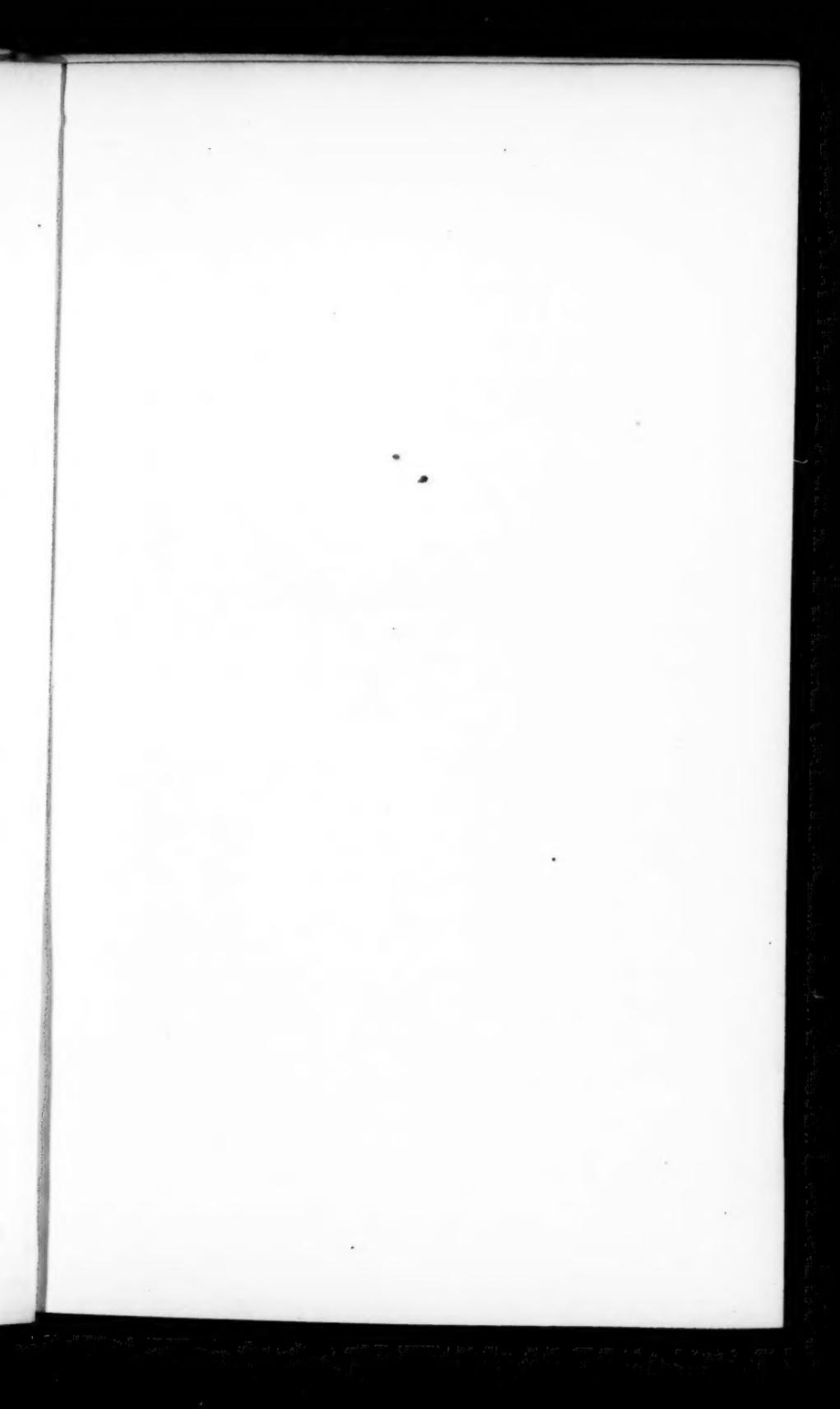
11 Spears, 10 Spear-heads, 5 Swords, 1 Knife, from the Somali Country.
Presented by Brigadier Coglan, Bombay Artillery, Aden.

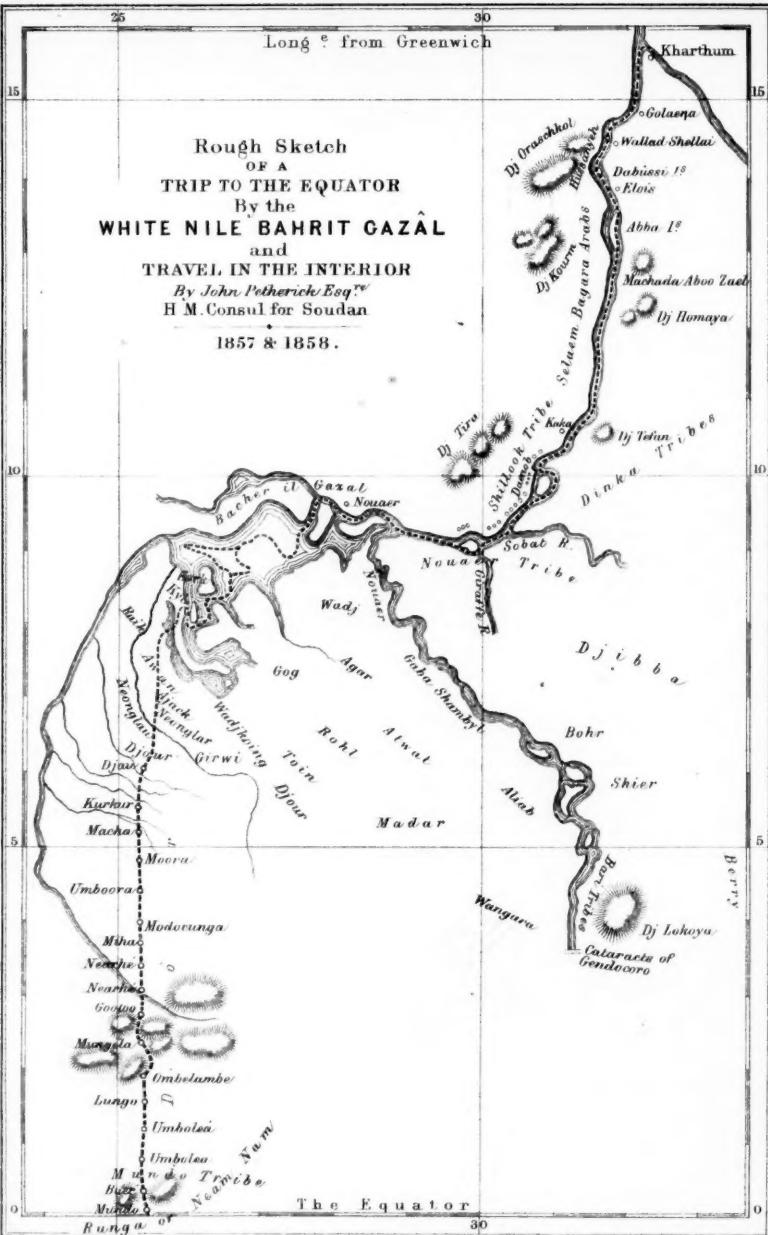
Naval.

Model of a Malay Boat. *Presented by Brigadier Coglan, Bombay Artillery, Aden.*

Miscellaneous.

1 Medal for Long Service and Good Conduct.
1 Ditto for Meritorious Service.
Presented by the Lords Commissioners of the Admiralty.





ON THE ARMS OF THE ARAB AND NEGRO TRIBES OF CENTRAL AFRICA, BORDERING ON THE WHITE NILE.

By JOHN PETHERICK, Esq., F.R.G.S., H.M. Consul, Soudan.

In compliance with an invitation from the Council of this Institution, to describe the arms of the tribes inhabiting the countries bordering on the White Nile, amongst whom it has been my lot to reside during the last eleven years, I must beg to solicit, in my behalf, the leniency of the Chairman and Members of this highly learned Society, whom I now have the honour to address, my knowledge of arms and the use of them being entirely unprofessional, and derived less from science than pure practical experience, which, had it not been superior to my descriptive powers, I have little doubt you would have been spared the present communication.

The rich and highly-elaborate Museum of this Institution, containing, as it does, specimens of every description of fire-arm, from the crude match-lock to the most perfect specimens of the rifle of our time; any remark of mine upon the subject will be superfluous, and I shall commence my subject with a description of those tribes who, if the use of powder be not entirely unknown amongst them, object to burn it, and prefer to combat single-handed with cold steel, as did their ancient conquerors the Greeks and Romans.

The Arab tribes, as you are well aware, bordering on the Mediterranean, and far into the interior of Western Africa, have for centuries been familiar with the match and fire lock. Ascending the Nile, the first Arabs, with but few individual exceptions, repudiating the use of fire-arms, are the Jemaes, Ababda, and Bishari tribes, inhabiting the eastern Nile bank, and thence the Desert, to the shore of the Red Sea. The territories of the Jemaes extend from north to south, from Cairo to Keneh, in Upper Egypt; the Ababda, from Keneh to the second Cataract, and following the Nile to the province of Berber, in the Soudan; whilst the Bishari inhabit the interior of the Desert, and the coast of the Red Sea, from the latitude of Wadi Halfa, or the second Nile Cataract, to the province of Taka, in the south-east of the Soudan.

The arms of the above tribes are fewer in number, and, according to their manner of using them, less destructive of life than those used by any other people with whom I am acquainted, and which I can only account for by the repugnance of the Arab generally to slay his enemy, but who would rather wound and disable him, in order that the feud may be confined to himself, rather than descend to generations, as, in cases of loss of life, nothing but blood will expiate it.

A cross-handled, straight, double-edged sword, worn in a leather sheath, suspended by a strap to the left shoulder, and a similar shaped knife or dagger, in a scabbard, attached to the left arm, above the elbow, are the only weapons of the Arabs of the above tribes; whilst for defence a

thick round shield, from 15 to 18 inches in diameter, made of the hide of the giraffe or antelope, is the invariable accompaniment, which, in the dry climate they inhabit, becomes so hard as to offer sufficient resistance to any blow that may be dealt on it with a sword.

The Arab of either of the tribes to which I am alluding makes use of his sword for cutting only, and then generally at the arms or legs of his enemy, instead of at the head or body, with a desire, as before explained, rather to disable than to kill him, for which reason he never thrusts.

It is only when down or disarmed, and sorely pressed, that he employs the knife, and then, unless he is convinced of the determination of his opponent to take his life, he will invariably strike at the members of the body in preference to any vital part.

The usual method of fighting adopted by these people, when tribe is arrayed against tribe, is on foot, first hiding their cattle in some distant wadi or mountain gorge; but on all marauding excursions, where plunder is the object, they ride fleet dromedaries, for the superior breed of which the Bishari are justly celebrated.

The Nubians, subdivided into Mahass, Kenoos, Dangolauis, Shaygyas, and Jabyeen, since the invasion and subjugation of Nubia and the Soudan by Mahomed Ali Pacha, have adopted the use of fire-arms in the shape of flint-lock muskets and pistols, in preference to the swords and lances of their forefathers; but the nomades of the desert, being less in contact with their conquerors, have retained their primitive arms and mode of warfare.

Thus the Kababish,* Meganeen, Hababeen, Hamr, Hauasma, and Bagara Arabs inhabiting the Kordofan and its deserts, in addition to the sword already described, use the spear and lance, but discard the knife, and defend themselves with a long oblong shield of tough antelope hide. These tribes fight on foot and on horseback,

When on foot they mostly confine themselves to the use of a shield, and several lances, which they throw at the enemy from distances amounting to forty or fifty yards.

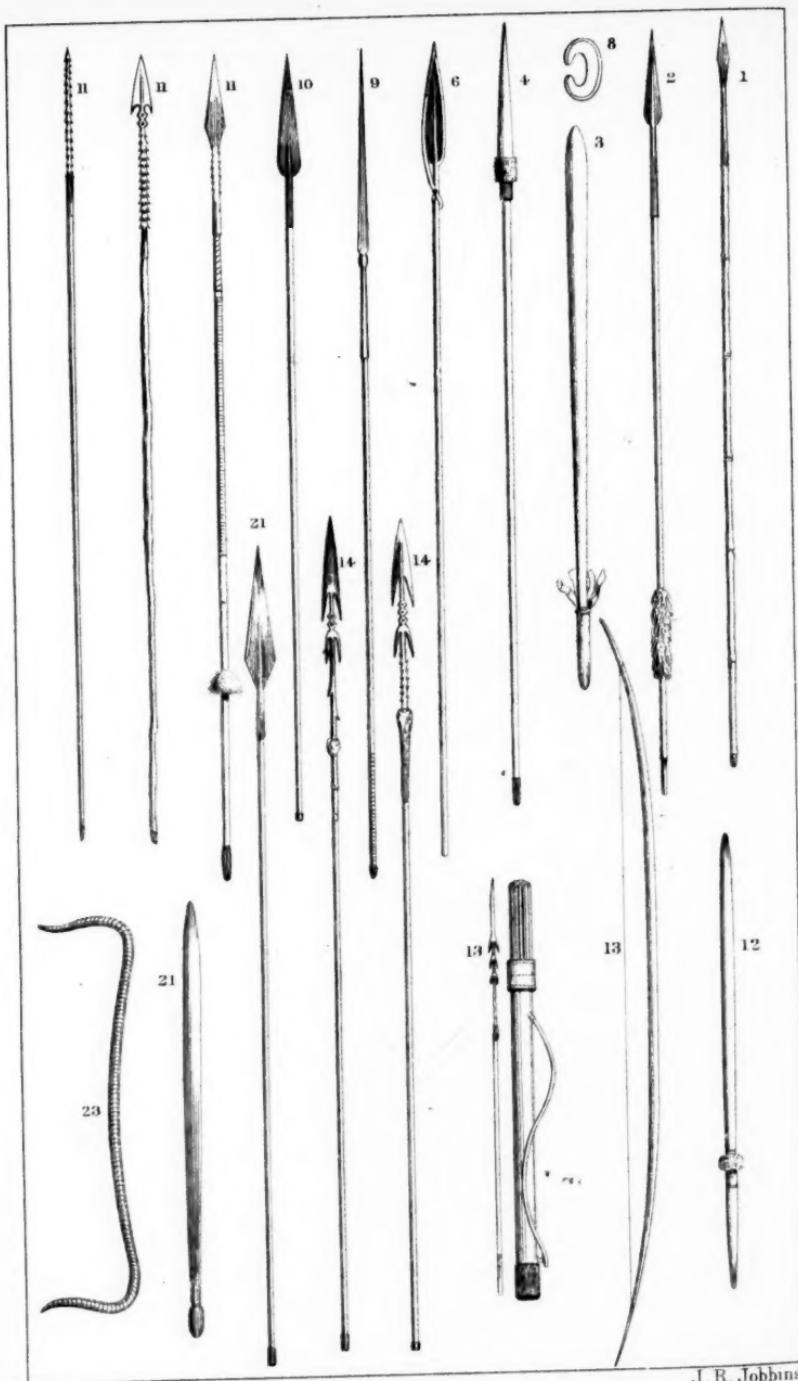
The horsemen, when going to battle, cover their cattle to the knees with a defensive armour of thick felt, and wear an iron casque and mail shirt over their dress. Their arms are only a sword and spear, which latter, being heavier and of stronger materials than the lance, is but seldom thrown, and then only when certain of effect.

Their mode of warfare consists in a series of brisk charges and as sudden retreats, the fall of a chief, or two or three leading men, being sufficient to decide a battle. The most bloody encounter that I have known during my acquaintance with them, when there have been perhaps 2,000 men engaged, has entailed no greater loss than thirty killed on the field.

They have a wholesome fear of fire-arms, and with two men only, armed with fowling pieces, I have on more than one occasion, whilst travelling in the deserts of Kordofan, kept large bodies of Arabs intent on mischief, at harmless distances.

Following the course of the Nile, and leaving the dependencies of Egypt, the first negro populations are the Shillooks and Dinka tribes, the former to the west, and the latter to the east of the Nile, both of which are large tribes, inhabiting a district extending from the 12th to the 9th degree of north latitude; and the Dinka tribes from the 29th to about the 33rd

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J. R. Jobbins

degree of east longitude. The Shillooks inhabit a narrower district, perhaps not extending to one degree of longitude, yet are equally as numerous a family; not being so nomade in their habits as the Dinkas, and attending more to agriculture, they live in large villages at but short distances from the river, and, employing canoes, enjoy greater facilities with regard to their intercourse with each other, than is the case with the Dinka purely nomadic race.

The pastoral Dinkas use only one large and two or three smaller lances (see figs. 1, 2), without a shield, a substitute for which is a heavy stick with which they cleverly ward off a coming lance, using it as a club (fig. 3), and with it drive their cattle, of which they possess large herds.

Iron the Dinkas have not, and they are obliged to purchase their lances from their neighbours the Arabs. As a substitute for iron, after insertion in boiling water, they straighten the horns of antelopes and gazelles for lance points (fig. 4).

Their method of fighting, as is the case with the whole of the negro tribes with whom I am acquainted, is on foot, as they have no beast of burthen, and, although they are large cattle owners, the ox has never been made serviceable, as among the neighbouring Bagara Arabs, to carry loads or man.

Leaving the Nile at its junction with the Sobat, and proceeding towards the source of that river, on one of its branches, in about 7 degrees north latitude, and 31 to 32 degrees east longitude, we find the Djibba tribe, a different race, with a distinct language; they are a fine, tall, and well-made people, of dark colour, and ornament themselves with skins of the panther and antelope; the scalps of their enemies, worked up and ornamented with cowrie-shells attached to their own hair, form a tail, which for length and breadth surpasses any thing of the sort worn by the most aristocratic or fashionable member of the celestial empire (fig. 5). Lances (fig. 6) and assayas, their only arms, are particularly sharp, the former often performing the duty of razors. The assaya (fig. 7), intended for throwing as well as cutting, in the same style as a scimitar, by gently drawing it when home, is capable of dealing a fearful wound, its edge being as sharp as hard wood will permit of; and to preserve it from injury, like the lance, it is protected by a stiff leather covering, removable at pleasure (see fig. 7).

The Djibba wears also a peculiarly sharp-edged iron bracelet on each wrist (fig. 8), which, for the double purpose of keeping sharp, and his skin intact, is also covered with a strip of leather, which, however, in case of need, he removes, and closing with his enemy, whom he grasps in his arms, is capable of inflicting serious wounds on him with his bracelets, thus proving the reverse of our custom, that the tighter the embrace the more cutting it becomes.

Returning to the Nile, and following to the furthest point known, the cataracts beyond Gondocoro, about 3½ degrees north latitude, the tribes are similarly armed to the Shillooks (figs. 21), with but slight variation in the shape of the lance, that used by the Barri being much longer in the blade than is usual amongst negroes of other denominations (fig. 9). The Nouaer on both sides of the Nile, from 8 to 10 degrees north latitude, wear a helmet made of cylindrical white beads (fig. 22).

The people bordering on the Bahr il Gazal, and the interior as far as the 6th degree of north latitude, in addition to the smooth lance (fig. 10), carry two or three barbed lances (figs. 11), which they throw at their enemy while charging, and which, if they penetrate into the body, are difficult to extract, requiring a most severe and painful operation to be performed.

Originally Dinka, and subdivided into many families forming distinct tribes, having their language only in common, these negroes, in addition to a stiff club (fig. 12) made from the root of a tree, which they are expert in casting as well as fencing with, carry an instrument like a bow (fig. 23), for the purpose of warding off projectiles, and which, with the club and a lance, or two, are grasped in the left hand, whilst throwing a lance with the right.

The next tribe to the south extends over 5 degrees of latitude to within 1 degree of the equator, differing in language as well as in habits from any of the tribes hitherto mentioned.

The Dör, in stature, are not so tall as their northern neighbours, the Dinka and their descendants, being a middle-sized, square-set, and muscular race of people; neither is their skin so jet black, but is of a dark brown or bronzed colour. They manufacture their own weapons from rich iron ores, which exist in what I consider to be the new red sandstone.

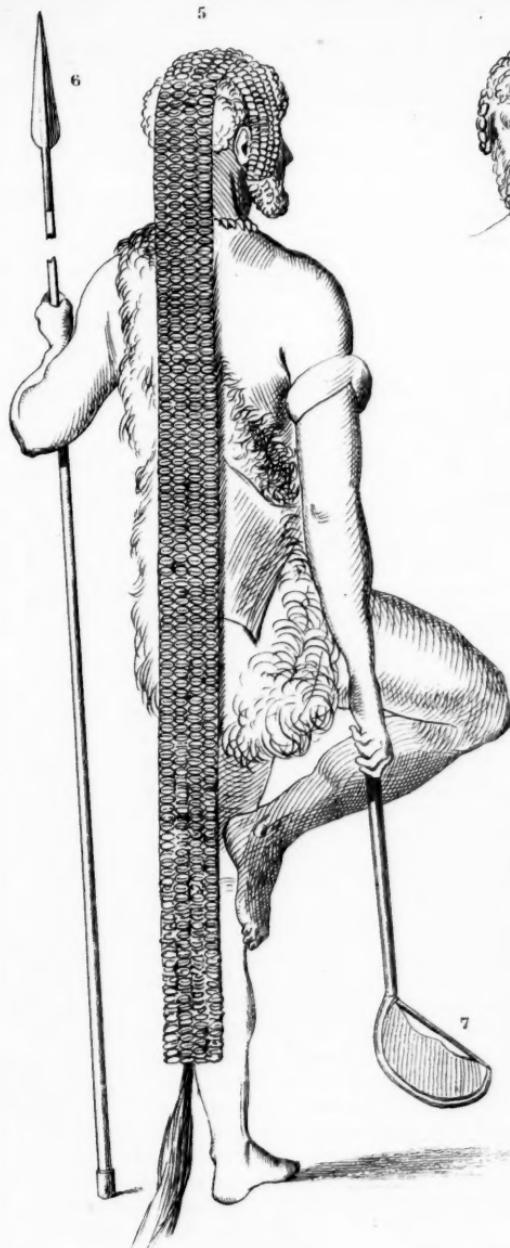
The great dissimilarity of the races inhabiting the district from the 6th degree of north latitude to the equator, the limits of my peregrinations, I consider to be caused by the presence of the Tsetse fly, which, by destroying the cattle, necessitates agricultural pursuits, while they in their turn entail fixed residences, though, strange to say, less warlike propensities are not thereby induced.

This tribe, superior to any other known to me in point of territorial possessions and population, recognises no individual chief, but is subdivided into distinct settlements or townships, over which a chief presides, whose sole authority by each separate community is upheld, and which, as a general rule, is at feud with some one or more of its neighbours living at but a few miles apart.

Their only domestic animal is the goat; therefore, for animal food they are obliged to follow the chase; and this often becomes the occasion of quarrels and feuds with their countrymen inhabiting adjoining districts.

Their arms, equally as their habits, differ from the Dinka or the Djour to the north and west of them; the favourite weapon of the Dör is the bow and arrow (figs. 13), with which they use three or four fearfully barbed spears (figs. 14), and clubs (figs. 15), dissimilar to any hitherto described, and, as is evident from the peculiarity of their shape, are not required to ward off a lance, for which purpose the bow suffices, but are used sometimes to cast, and invariably to inflict a blow wherewith to crush the skull of a fallen enemy.

The workmanship of the arrows will bear inspection (fig. 13), when it will be found that the heads of scarcely two are alike, and the generality of them so numerously barbed that extraction cannot take place without making a considerable incision to free it from the muscle or flesh in which it may be imbedded.



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Occasionally, some of these arrows are poisoned ; this, however, with the Dôr is but rarely the case, as they are also used in the chase.

Poisoned arrows are more commonly used by the tribes south of Fazogl, on the confines of the Gallas and Abyssinia, and are less dreaded than might be imagined, as burning out the wound by an immediate application of fire, such as the ignited end of a stick, will invariably counteract the otherwise deadly venom.

The tactics of the Dôr when giving battle are to run up to within fifty or sixty yards of the enemy, and discharge a quantity of arrows at him, and if not successful, to undertake as rapid a retreat; when followed and approached, they receive a similar flight of arrows, which, after endeavouring to evade by a series of gymnastics, as soon as they are spent, they repeat the charge, and so on, until on one side or the other so many arrows have taken effect as to impede the rapid movements of a certain number of the party, which is taken advantage of by a hot pursuit ; then, when encumbered by the arrows, the men that have been so hit, unable to extract them and accompany their unscathed companions, drop behind, and thus become the objects at whom to throw barbed lances. If hit by several arrows, or a barbed lance, the unfortunate Dôr, finding no safety in flight, will, like a stag, stand at bay, and endeavour to keep off his pursuers as long as he is provided with an arrow or lance ; when, deprived of his own arms, and compelled to stoop to pick up those that have been thrown at him, his relentless enemy, taking advantage of the movement, soon puts him *hors de combat*, by one or more lances in his body ; a rush is then made at him, and, if not already down, he is felled by a club, and with the same instrument an end is put to his sufferings.

This sort of running warfare may suit a people with light arms, and unencumbered with clothing ; but, having joined a party as a spectator, it was entirely unsuited to myself, attired in a shooting jacket and the paraphernalia of European costume, as, although in tolerable marching condition, the constant running took the wind out of me, and, with only a few men left behind, I was exposed to the charge of the whole body in pursuit. A bold front, and a demonstration of making use of my fire-arms, sufficed to bring the enemy to a full stop and take to a precipitate retreat, which, with little power and less inclination to pursue, and having seen sufficient to satisfy my curiosity, I allowed my friends to take advantage of, from which they returned with four of the heads of the fugitives in their hands, as trophies wherewith to ornament a tree or a pole over the huts of the victors.

Previous to this I had seen the heads and hands of three victims, taken for similar purposes, the bodies of which were secreted in thick bush, to elude discovery and burial by the friends of the slain.

The negroes it will be observed, unlike the Arabs, endeavour to slay as many of their enemies as possible, and have no compunction at destroying life, and so brutal are the particular tribe to which I now allude, that it is a rule with them never to make prisoners, but kill even women and children.

It has been my good fortune, during three years' intimacy with this tribe, to arrest the most atrocious massacres, a recital of which would be more painful than edifying.

The Mundo tribe inhabit a hilly and even mountainous country between the equator and the first degree of north latitude ; and, in preference to the bow and arrow, use the barbed lance (fig. 14), a shield formed of a single narrow piece of hard wood, with a boss in the centre, as a guard to the hand (figs. 16), and an iron projectile not unlike a bill-hook, or curved sword (figs. 17).

Clever in the use of this instrument, the Mundo throws it with considerable address, employing it in the chase for killing antelopes, or even smaller game. If he succeeds in breaking the leg of an antelope, it has but little chance of escape, as the hunter pursues it obstinately, killing it eventually with his lance.

The Runga, or Neam Nam, inhabit the regions of the equator, and thence south, and are a large, powerful, slave-holding tribe, calling themselves cannibals, and reputed to be so by their neighbours.

It was not without difficulty that I succeeded in forming friendly relations with these people, and not until I had killed a vulture, which was hovering over my party, and subsequently an elephant, within the limits of their village, would they listen to overtures of any description, convinced though they were by the great noise and effect of my fire-arms, of which they had previously neither seen nor heard, as they afterwards expressed themselves, that it was in my power to exterminate the whole race.

The Neam Nam make war on their surrounding neighbours for the purpose of kidnapping slaves, to whom they entrust the cultivation of their lands ; and, although holding them in perpetual bondage, treat them with consideration and kindness.

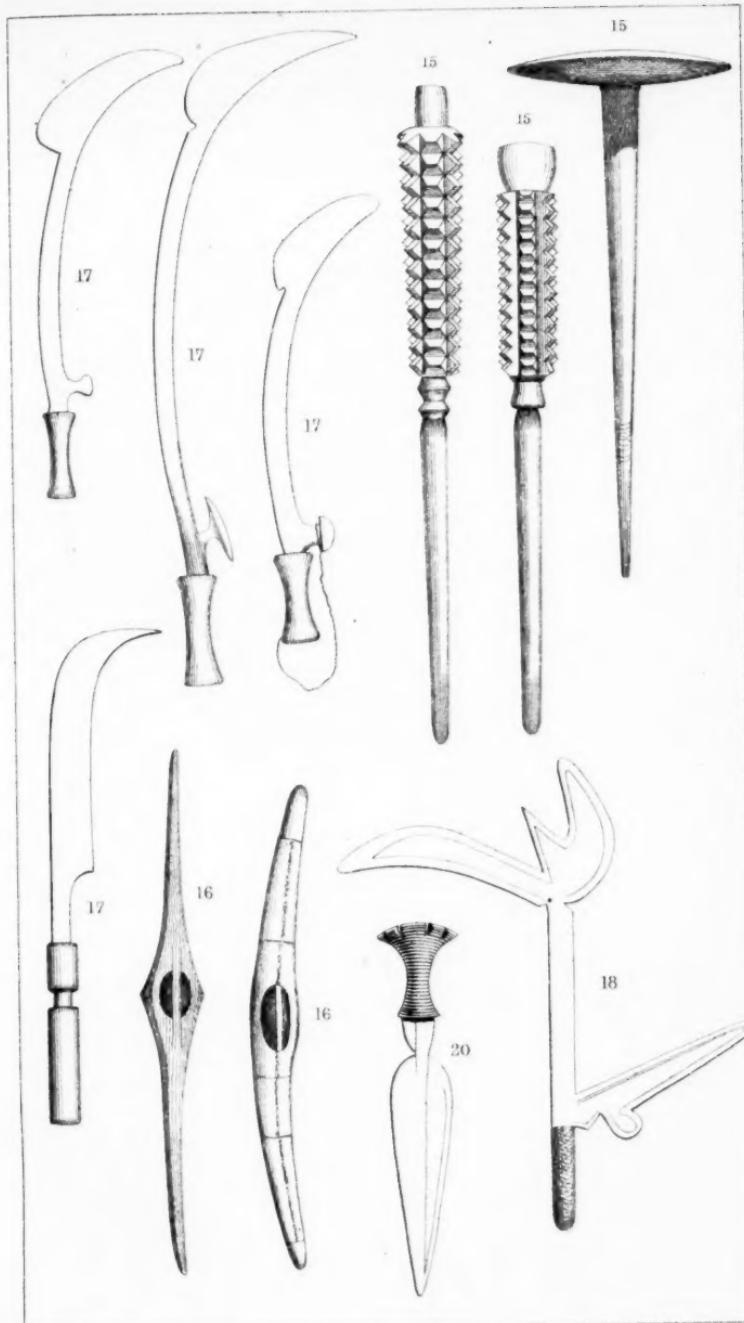
The only occupations which a Neam Nam will stoop to, are war and the chase, to which he is from early youth inured, and thus becomes the terror of the neighbouring tribes.

His arms consist of the smooth and barbed lance (figs. 10, 14), and a curiously-contrived projectile (fig. 18), of which I regret to have lost the best samples, with many other curiosities and living animals, by the wreck of my boat in the Nubian cataracts.

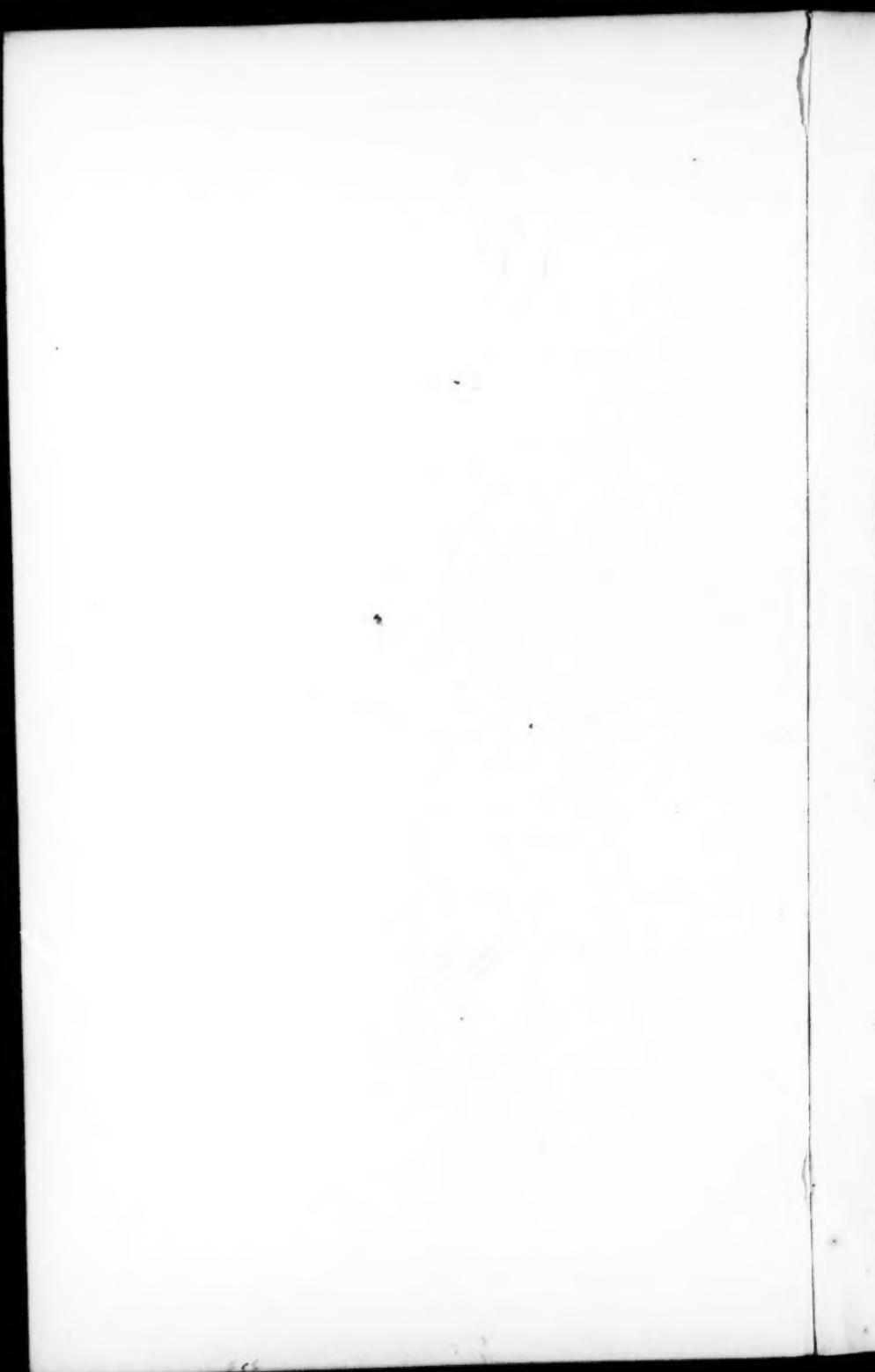
The shield is made of reeds, or the leaf of the palm-tree, interwoven in tasteful patterns of variegated colours (fig. 19) ; and a kind of cloth, with which they cover themselves, is also made by this tribe of the inside fibres of bark, the threads of which are dyed with several colours.

When giving battle, the Neam Nam has two or three of the iron missiles already alluded to (fig. 18), suspended by a leather button to the inside of the shield, lying directly over the handle of it, the whole of which, and a couple of lances, he grasps with his left hand, whilst with a lance in the right hand he assails his enemy. The iron weapon, when employed, is thrown with great force, and in such a manner as to revolve upon its centre when spinning through the air, therefore the wound created by such an instrument must be a fearful one.

The shield made of so light a substance will not repel a lance, but when struck by one, the combatant giving it a slight movement, either to the right or left, counteracts the penetration of the lance, which, becoming entangled and suspended in it, furnishes him with his enemy's weapon, in lieu of his own, which he is supposed to have cast.



J.R.Jobbins



Attached to his waistbelt is a knife (fig. 20) suspended by a ring to the scabbard, hilt downwards, which perhaps is the most convenient way of drawing it, being easily done without requiring the assistance of the left hand, and, fitting tight, undergoes no risk of falling out. The point of the sheath, it will be observed, is turned outwards, so as effectually to prevent its injuring the owner in case of a fall or whilst stooping.

The negroes generally trust less to a shield to ward off a lance or threatened missile than to their great agility in jumping out of its way, at which they are exceedingly clever, and their frequent complaint against fire-arms is, that, not being able to see the ball, they cannot evade it.

With regard to manufactures I may, perhaps, be permitted to state that the Shilooks work a very neat mat of reeds, which, spread on the ground, is doubtless but a modest dining table, but of which they are proud; these mats are of various colours and numerous patterns.

But for the first attempt to manufacture an article of dress of a complicated nature by an independent negro tribe in the regions of the Nile, the merit must be given to the Neam Nam, a specimen of their work, as a relief to the dark side of their character, that of cannibalism and slave-hunting, I am happy to introduce to your notice.

Trifling as the present sample of negro manufacture may appear at first glance, it proves that those races hitherto ignored by the civilized world, and abandoned to their own impulses without the benefit of any moral check or example, are at least possessed of sufficient intellect, and even industry, to give rise to hopes for improvement, both morally as well as spiritually, were they but afforded the opportunities; and I cannot close the subject of the present paper without availing myself of the opportunity which it affords me to express a hope that it may be the humble means of enlisting the sympathies of the Members of the Royal United Service Institution in behalf of the country and tribes which I have had the honour to introduce to their notice.

Evening Meeting.

Monday, May 16th, 1859.

Colonel P. J. YORKE, F.R.S., in the Chair.

ON A PROPOSED NEW SYSTEM OF FORTIFICATION.*

By JAMES FERGUSSON, Esq.

MR. FERGUSSON. Mr. President, it is now as nearly as possible six years since I had the honour of addressing an assembly in this place upon the subject which I am going to broach this evening; but I am bound to say that I have very little to add to what I then said regarding it. Perhaps it will be considered somewhat conceited in me to say so, but I have seen no reason to alter my views, for, though there is no doubt that great progress has been made in the subject since that time, all that has passed has only tended to confirm me more and more in the correctness of the views I then enunciated. I now in consequence feel so strongly confirmed in them that I cannot but feel that I may be justified in bringing them again before you, more especially at the present time, when everything concerning fortification is of such intense interest that I am sure I need make no apology for so doing.

It was not however my intention to have brought forward the subject again at present, nor till the results of the late war were more completely before the public. Since I last addressed you we have gone through a war of great importance, and principally a war of sieges, and those sieges bear most distinctly and strongly upon the science of fortification, so that I wished, before I again brought the subject forward, to be more fully in possession of the details of those sieges, and when the Committee of this Institution asked me last year to lecture upon my system of Fortification, I declined, because I had not then such information as I thought would give novelty to anything I brought forward. On the present occasion the same reason exists, but the interest felt upon the subject is now so great that I thought it judicious to waive my objection, and to bring forward such information as I possess.

During the great war with Russia, three very important sieges took place. One was at Bomarsund, and that was entirely a siege of a masonry fortress—and that masonry fortress was knocked down in a shorter time than any fortress of the same importance was ever destroyed before. The next siege was at Silistria, where a little earthwork called the "Arab Tabia," resisted longer than any earthwork had ever done before, and eventually beat off

* This Lecture was delivered by Mr. Fergusson on the 16th May, 1859, and was followed by the discussion which is appended to it. It was thought better not to publish it in the Journal in the order of its date, but to reserve it until after the reading of another paper on the same subject, by which it was expected that the discussion would be continued. The second paper and discussion will be found at page 198, *et seq.*

the enemy. Many persons may state that there were extenuating circumstances; but it is a curious coincidence, at least, that the masonry went down and the earthworks stood. The third siege was Sebastopol. I am aware that there is a great deal to be said on both sides with regard to that great struggle; still what I brought forward here when I last addressed you was, that the only mode by which a place could be fortified was by the use of earth and an abundant supply of guns; that guns and earth were the only means of defence; and that further, the mode in which these elements were used was of the utmost importance. What I then contended for was to have a sufficient power of artillery, and that artillery not propped on masonry. Those were the great principles that came into play at Sebastopol, and the siege was of necessity the most important that has ever taken place since the invention of gunpowder. These, gentlemen, are very important facts, and give me confidence in saying now that I was not much mistaken in the views I before brought forward; but another circumstance besides the events of that war has induced me to come forward, which is this:—recently we have had a complete revolution in firearms, “Brown Bess” has been abandoned, and an improved rifle has been put into the hands of all the soldiers of Europe. Artillery has, within the last twelve months, been entirely revolutionized through the exertions of various ingenious gentlemen, but especially by our countryman Sir William Armstrong; so that in all future wars artillery will be a very different arm to what it has been before.

The old system of fortification was invented during the reign of “Brown Bess,” and it was invented for the purposes of the imperfect artillery and the imperfect musketry of former days. Those imperfect arms are now superseded, and I am convinced that the old system of fortification must be abandoned also. I believe that many artillery officers who were inclined to oppose me on former occasions have come round a good deal to my views. I may also state that the works which are now being erected at Portsmouth are earth-works such as I would myself have designed, and that in every respect these works are of a very improved and superior form to anything that has been done before. I believe also that the difference which exists now between me and those who have differed from me formerly is very much less than it was.

I may also add, that, during the ten years which have elapsed since my work on Fortification was published, no one has pointed out where the error was in what I then brought forward. There has been a good deal said about details, and I do not mean to say that there was not more or less truth in many of the objections, but the fact that the great principles which I then proposed have been unrebuted I believe I may say is unquestionable.

We shall hear to-night what further objections can be made.

Let me now try and explain to you as briefly as I can the steps by which the present bastion system came to be adopted, and then, as briefly, the mode in which I believe its defects can be remedied. You will excuse me if I am very elementary in what I am going to say, and if I in fact tell you what you all know better than I do myself.

You will recollect that one of the first modifications of fortification adopted after the invention of gunpowder was substituting a low *caponiere*

in the bottom of the ditch for the high flanking tower, and this was further concealed by a glacis, which was also invented in the sixteenth century, and served with the ditch to conceal the masonry of the *escarpe*. This done, the next step was further to conceal the *caponiere*—the immense importance of which was immediately appreciated—by a counterguard; and the face of this being flanked by the opposite *caponiere*, by easily traced steps this was gradually worked into the bastion form with its flanks.

The next necessity was to give the garrison a *pied à terre* across the ditch, this was done by a small triangular redan which served as a *tête du pont* to the besieged. This done, it was immediately perceived how important the faces of the bastion might become in flanking the face of what was then called the ravelin, and again how important an office that might perform in flanking the ground in front of the bastion. In fact, it was found that the bastion with the ravelin formed so perfect a system of mutual support and defence that by proper arrangements a place might easily be made impregnable against a *coup de main*; and, as for more than two centuries some of the very first talent in Europe has been devoted to the perfecting of this system, it has come out of their hands one of the most complete and perfect pieces of design that human skill has produced. Were infantry in the habit of shouldering their muskets and cavalry of drawing their sabres and marching up to the edge of the ditch to take the fort by storm, there would be an end of the question, and a siege would be an impossibility; but, and the *but* is most important, this never has occurred in past sieges, and is not likely to occur in any future operations, simply because the fort is perfectly organised against such a mode of attack, but is perfectly open to another, by which, without risk or danger to the besieger, the fort must fall into his hands within a certain limited number of days.

I need not explain to this audience that, by the establishment of enfilading and shell batteries, by ricochet and direct fire, the artillery of the fort can certainly be destroyed over the limited space which it is necessary should be attacked, that while this is being done the sap steadily and certainly approaches the edge of the ditch, and, when the besieger gets there the conditions of the fight are—a large besieging army with a powerful untouched artillery opposed to a small dispirited garrison without a serviceable gun, and nothing but a few ruined untenable mounds behind which they can hardly find a shelter even for repose, much less for defence; and the result is inevitable, and always has occurred and always will where the conditions are the same.

But the great question still remains unanswered—Are these conditions inherent in the problem? Is it true, as has been so often stated, that, since the invention of gunpowder, the art of attack must be superior to the art of defence? In fact, is fortification impossible?

My own conviction is that all the conditions of the problem may be altered, that the defence may be made superior to the attack, and that the whole difficulty has arisen from a false system, from pursuing an erroneous path, and neglecting any reference to the first principles of the science.

I will now try to explain to you the mode by which I propose these defects should be remedied.

First then, I conceive that a fortification to be of any value must possess two essential qualities at least—it must be secure against a *coup de main*,

or an attack *de vive force*, and it must be able to maintain a superiority over the artillery of the attacking party.

I have just attempted to explain to you what an immense amount of superfluous ingenuity has been bestowed on the bastion system to obtain the first object. I call it superfluous, because I believe that a wall, say 30 feet high, if efficiently flanked by a cross fire of artillery and musketry, cannot be escaladed, or in fact cannot be passed over until it is breached or destroyed by some means or other. If 30 feet is not high enough, make it 35 or 40. If 7 guns in each flank are insufficient, put 14 or 30. It is a mere question of expense and of construction. The position of the wall is of no importance provided it surrounds the fort and is equally strong throughout; and I may add, you cannot have too little of it, in the first place because nine-tenths of the expense of modern fortifications consists in their revetments, and, secondly, because the less you have the easier it is watched and the easier defended by a small garrison. In other words, if a front of fortification has 1,000 yards of *escarpe* to defend, and especially if that is broken up into detached portions, it will require twice the number of men to watch and defend it as compared with a front which has only 500 yards to be looked after.

To be of any use, this wall must be preserved till at least the enemy is able to establish breaching batteries at the edge of the ditch, a condition not obtained in any system at present in vogue in Europe. In the French system the face of the bastion can be easily breached by firing down the ditch of the ravelin, and its flanks destroyed by firing along the main ditch. It is true that is not generally done, because they are so utterly contemptible and so easily destroyed from the edge of the ditch that it is not worth while to waste time or the powder and shot to do it from a distance. But, besides this, every one of the *escarpes* can be hit by direct firing over the crest of the glacis. Practically the cordon is seen everywhere, and a very slightly reduced charge will enable a ball to hit sufficiently low to do immense damage; and in fact to bring down the parapet. Now instead of this I propose where wet ditches cannot be obtained to dig so deep that the cordon of the *escarpe*, instead of being 8 or 10 feet above the level of the country, shall be 30 feet *below* it, and, as there is no glacis, the difference is even greater than this, because, to fire over his own sap, the besieger must fire as high as if the glacis were there, so that to hit the cordon the ball must fall say 40 or 45 feet in 200, which is 1 in 5 to 1 in 6, and a ball falling in that angle can do but little injury to a well-built wall, and its aim must be so uncertain that no danger need be apprehended from that cause. But it may be said, if your wall cannot be touched your flanking defences may. If the curve is flat this is not so. The flanking batteries must be placed at such a distance as to be nearly innocuous, but with sharp curves there is no doubt but that a battery at a distance of from 1,500 to 2,000 yards might pitch shot into the ditch which might hit the *caponiere*, the cordon of whose *escarpe* was 30 feet below the country; but is such blind, uncertain fire really to be dreaded? If so, precautions must be taken against it by thicker and better masonry being used; by glacis and counterguards, and other expedients by which the defect might easily be remedied; but still, supposing the *caponiere* very considerably damaged, the besieger cannot avail himself of this fact till he has reached the edge of the

ditch, till he has established himself there, and till he has got his breaching batteries in order so as to enable him to knock down the untouched *escarpe*.

But supposing, for the sake of argument, that these *caponieres* can be destroyed, as has been asserted, from a distance, the proposition still stands thus, as comparing it with the bastion system,—if a wall whose cordon is 30 feet below the country can be thus breached, how much more easily can a wall similarly placed, but whose cordon is 8 or 10 feet above the plane of *sitè*? To say the very least of it, it must be ten times more easy to destroy the flanks of the bastion system than those of that I am proposing, and the destruction of the one opens the place; those on my system are independent, and their destruction only weakens the flanking defence.

This however is by far the easiest part of the problem, and the one regarding which my proposals possess the least novelty; because, beyond burying the masonry deeper than ever was proposed before, I am willing to accept the principle of either the bastion or the Prussian system for this purpose.

The second part of the problem alluded to above is of by far more difficult solution.

It is how to prevent the enemy from getting to the edge of the ditch, or at all events getting his artillery into position there. This, as far as I can see, can only be done by the besieged preserving his artillery in an efficient state throughout. Every siege of modern times has proved that this is impossible on the bastion system. Still I cannot but think that it can be done, and done easily; but, before trying to explain how, let us try and arrive at some general principles on which to base our reasoning.

In Sir John Jones's "Sieges in Spain," it is said that "two or three guns in the prolongation of any face are sufficient to dismount ten, twelve, or any number of guns upon it," and generally it is admitted that one gun in the field is equal to three or four in the fort, and practically in all regular sieges this has been the case. Though generally very inferior in number or in calibre, the guns of the besiegers always are able to overpower those of the besieged. Reasoning *a priori* this ought certainly not to be the case. The first has the command of masonry, and the choice of position; besides, having leisure in time of peace, the engineer ought at least to be able to place himself on an equality with his opponent, and that he has not been able to do so hitherto is a fatal objection to all the systems yet proposed.

In trying to explain whether this objection is insuperable or not, let us assume that two batteries of 10, or any equal number of guns, are erected on a level plain opposite to one another. All things being alike, there is no reason why battery A should not be equal to battery B; but, if battery A has the choice of ground, if it has time to perform its work before hand, and to allow it to consolidate, while battery B is erected in haste under the fire of A, *pro tanto*, A ought to be superior to B. If the place to be fortified is an isthmus of equal width throughout, and which cannot be enfiladed on either flank, 100 guns defending it ought to be equal to the same number, which are all that can be brought to the attack; but if the defenders can choose a wider space, or a spot having some advantage of command or otherwise, their artillery ought always to be able to silence that of the attacking party.

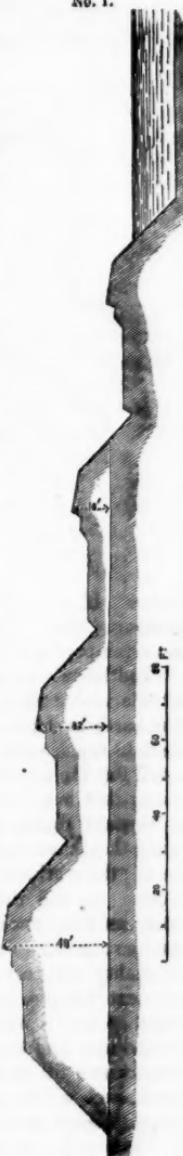
This however is assuming a peculiar local condition which can rarely occur, though it does occur at Portsmouth, and oftener than would generally be supposed; but, granted that it will not do to design for such a contingency only, it is a fact that circles described with a radius of 5000, 6000, or 7000 yards are practically, as far as defence is concerned, straight lines. The *enceinte* of Paris is for instance, or might be made, practically a straight line; so is the proposed *enceinte* of Antwerp, and so in fact must all *enceintes* now be that are intended to defend arsenals or towns from the effect of bombardment with guns throwing shells 9,000 or 10,000 yards. A less radius is absurd, and practically it is immaterial whether we take the circumference or the tangent of such a circle.

No. 1

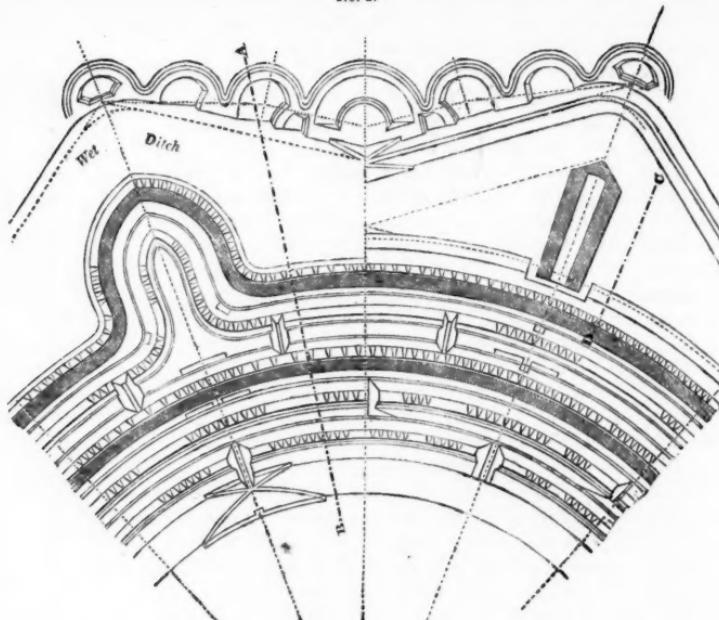
Still there are circumstances in which smaller perimeters must be used; and, if these cannot be fortified according to this system, it fails. Let us take for instance a radius of 1,200 or 1,500 yards; such a fort could mount from 600 to 700 guns, and, if a train of, say 100 guns, were brought against it, it could easily, without skewing the embrasures, bring a greater number to reply. If the besiegers' train consisted of 200 guns the fort could hardly match it, and if 300 it would be overpowered owing to the large circumference on which the besieger could and would place his guns.

The way I propose to meet this difficulty is by placing two, three, four, or more ramparts of earth one behind the other, as shown in section in the diagram No. 1, and in plan in woodcut No. 2; and by this means even a very small fort may be able to point a greater number of guns at any given spot than the besiegers can from their space point at the fort.

To this arrangement several objections have been raised, which I shall notice presently; but first, the expense cannot be objected to, for, as explained before, if your masonry is to be protected, you must have far deeper ditches than were ever yet proposed; and, if wet ditches are available, (and they are far the best,) they must be far wider and deeper than any yet executed, so that the earth is there, and must be used for some purpose or other, and, to whatever extent it is so used, still these ramparts will never form more than one-fourth or one-fifth of the expense of any system of fortification. In the regular systems of Europe earthwork is about one-tenth of the total cost; and my proposal is, that, in order to get rid of our earth, we should have ramparts arranged in, say four tiers. The first question that naturally occurs is, In what respect is this less advantageous than a rampart in one tier



No. 2.



only? If it is found so, arm only one tier, and let that be the fighting rampart; and in the first instance let us assume that it is the upper or near rampart that is so armed.

Todtlenben's idea of a perfect rampart is one of earth of the ordinary profile with a very broad berme in front; that berme, he says, catches all the earth knocked away from the rampart above. The workmen can stand in it to replace the earth, and in itself it forms an immense magazine of stuff for the repair of the damaged rampart. With all due deference, I fancy this is a very clumsy way of attaining the desired end. The berme is exposed during the whole siege to the distant shot of the enemy, and after they have reached the edge of the ditch, when its importance is all in all, the workmen dare not venture upon it day or night. Now, supposing we call the rampart in front of the one that is armed a berme, and you have attained all these objects at all stages of the siege, and the rampart in front covers the workmen by day as well as at night, so that in reality the rear rampart can be repaired as fast as it is damaged. Let us next assume, however, that the besieger does pound this rampart to dust, so that it will not stand under any repair, you have only to descend to the next and the next, and renew the combat with fresh guns and fresh embrasures till at last you meet him on the *fouisse braie*, which he has never seen, and which is equal in extent to any batteries he can place on the opposite edge of the ditch.

How such a mode of defence is to be met or overcome I do not know.

I am certain that nothing like it has yet been met in any siege ; and I have not heard any suggestion that seems to me to meet the difficulty.

As this mode of fighting the fort suggests one of the objections made to my plans, I may as well mention it at once. It is said that shells fired horizontally, and embedding themselves in the rear rampart, would in bursting render the one in front untenable.

The first answer I could make to this is, that engineers generally do not believe it. Take for instance the new fortifications at Cherbourg. Every bastion there has a rear rampart, placed as I have placed mine ; and they are not afraid of the consequences. So too at Paris, and in almost every modern fortification in France and Germany, this feature occurs. Are they all mistaken ?

If so, I have erred at least in good company ; but, if it is so, I can easily remedy the defect, and they cannot. In the diagram (woodcut No. 3) I have lowered the angle from 45 to 25 degrees, and my belief is that a shot or shell fired from below would glance off and ricochet,—or if it buried itself it must explode upwards, in the line of least resistance, and do no harm to those in front. But if that angle is not low enough it can easily and with advantage be made lower. It is a mere question of £ s. d. For every degree you lower it, you must expend so many cubic yards of earth, and if you are prepared to do that, you will gain many advantages. In this woodcut I have also drawn, for the sake of comparison, a section of a rampart of the ordinary construction as applied to the system of Vauban, and, in order to show more clearly wherein the difference between the two systems really lies, I have adopted the same form of revetment for both, though it is one that I by no means think the best that can be used in either case.

It has been said it is no use providing so many embrasures, as it would be impossible to use them altogether,—that the wads and fire from the rear rampart would explode the powder and kill the men in front. All which I admit to be quite true. All I ever ventured to suggest was that you might fire from alternate ramparts, and I still fancy that can be done, but on that point I am quite willing to give way. When guns are covered by Haxo casemates or blinded in any way, it would of course be easy to fire from proximate ramparts, and if the angle of the earth is lowered, as just explained, this would be facilitated very much, and might be carried so far as to render the fighting of alternate ramparts easy ; but a cheaper and better plan would be I believe lateral extensions, or, in other words, using a larger radius.

Another objection stated is that blind fire, aimed night or day, will hit the fort, and do damage somewhere. The first of the objections applies to all forts, for that must be a very bad shot indeed which cannot hit a fort ; but I maintain that as far as damage is concerned it is much more likely to be done when there are quantities of masonry than where only earth exists, and, as far as blind fire damaging material or killing men is concerned, that is easily provided against. In the first instance, because the lineal feet of parapet provided in this system is so immensely in excess of what can be required that the guns may be spaced 40 or 50 feet apart and a traverse placed between each, besides the great magazine traverses which I propose dispersing everywhere ; and, as for the chance of a shot

No. 3.



Section of Rampart proposed by Mr. Fergusson.

No. 4.



Section of Rampart with Cavalier Bastion System.

lobbing along a *terre pleine* and killing a man, it may do so, but a besieger who would spend his ammunition for such a purpose, would, I fancy, very soon tire of his investment.

Another objection I have often heard quoted is, that, once the enemy gets on the lower rampart, he can run up the slopes of the others, and so get into the fort. Perhaps he can, but those that make this objection entirely overlook the difficulty of his getting there. When he is on the *terre pleine* of an ordinary bastion he does not require even that exertion; —the place is his, but all the ingenuity of the engineer is devoted in both systems to prevent his getting there. But would it in fact be so easy? Even supposing the revetment breached, and the successive ramparts damaged, so as to form a breach, nothing is so easy as to cut the ramparts across by traverses or trenches, and to protect them by *cheveaux de frise*, and fill these trenches with men firing in flank, and to have cool troops in perfect order prepared to fire on the flank of the disordered column of attack as it passes each of the five *terres pleines*; and who are the troops that could stand such an assault, and that would not be hurled back into the ditch? I do not know of such a feat performed in any modern siege, but it may be done of course.

But can such a rampart as I propose be breached? Let us suppose the besieger to concentrate the fire of 100 shell guns, 100 mortars, and if you like 100 shot guns, on one spot of the rampart,—he can of course pound a space say 20 or 30 yards wide into dust, from front to rear, and render it as smooth as a glacis. But what has he done when he has accomplished that feat? Not one spadeful of earth has fallen into the ditch,—not one spadeful has been carted away. It is all there, and can all be replaced, as soon as his fire ceases, and in the meanwhile he has only temporarily interrupted the communication along the rampart, and destroyed the emplacement of some 20 or 30 guns. But if the curve is sufficiently flat or the ramparts sufficiently numerous, there are plenty to spare on the right or left of the breach, and the mastery still remains with the fort.

But I must not tire you by enumerating objections which can hardly be seriously made, and must conclude this part of my subject by saying why I always prefer circular to rectilinear forms. In the first place, they are cheapest, because a circle incloses a larger space than any other mathematical figure. It is also simple, and consequently more easily handled and adapted to uneven or irregular ground. It is more easily understood, especially by undisciplined troops, and it is the only figure which can be made equally strong in every part. With a polygon as low as a pentagon or hexagon there are dead angles, which are fatal to their equal defensibility, and on each side of the angle the parapet can be cut through, and the reverse of the neighbouring side exposed. With polygons of eight or more sides these objections gradually diminish, and exactly in the ratio to the number of sides, so that a polygon of an infinite number, or in other words a circle, is the most perfect. But practically I do not know one disadvantage that accrues from the use of circular forms, and I know many advantages; and on the other hand many if not most of the disadvantages of the modern systems must be admitted to have arisen from the supposed necessity of using straight-lined forms; but let it be understood I by no means see any objection to their use in revetments if their employment is

wished for there ; but, in the active or offensive part of the defence, I am sure their use is always prejudicial.

In conclusion, in order to understand what I have been saying, you must allow me to reiterate and to impress on you as strongly as I can, that which I conceive to be the real defect of the bastion system,—that it is organised wholly for passive defence, that all its ramparts are designed and all its guns placed to flank ditches or *escarpes* and bits of ground in the immediate vicinity of the fort, to the total neglect of active defence. Now what I propose is to separate these two elements entirely, to make my flanking or passive defence one thing, as simple and efficacious as I can, and, having done this, to prepare in its rear a battle-field for my artillery, so as to enable it to compete on equal or superior terms with the artillery of the attack ; and this I believe has been done in the scheme I am laying before you ; and, if you will shake off the idea that these ramparts ought to possess flanking or passive powers also, I think you will admit that they will probably answer their purpose.

I can perfectly understand the difficulty any one educated in the principles of the bastion school must have in perceiving this. As before explained, that system is arranged wholly for passive defence ; but let me repeat, what I have attempted is to add to that system an active element. I believe I have retained all that is needful of the principles of the bastion system, and in some respects improved on them, and that the new element of a powerful artillery facing the enemy at all times of the siege is a most important addition, which cannot possibly do any harm, but all I think must admit that it may be of use.

My conviction is that it is the most important element of defence. I do not however assert that what I propose is the *only* way in which this end may be attained, or even that it is the *best* way ; all I assert is that it is a way, and I ask that it may be admitted to be so till another or a better is suggested.

It only now remains to say one word about the effect which the new inventions in artillery are likely to have on this or any other system of fortification. My own opinion is very distinct. When I wrote my book some ten years ago, it was done with the conviction that the improvements then made in the means of attack had rendered antiquated the usual means of defence. What then seemed an hypothesis, now appears to be a fact. Such a missile as that thrown by Armstrong's gun will certainly cut through any masonry that may be in any degree exposed, and the shells it projects will as certainly cut through any parapet ; so that, wherever there is an angle, there the lateral faces can certainly be laid bare and taken in reverse, so that I look upon all angular systems as utterly exploded ; and, although the German Trace is far better, and they generally avoid salient angles, and also have sometimes a tolerable perception of the necessity of the separation of the purely defensive from the offensive element, still they almost invariably expose their masonry to such an extent as entirely to neutralize the excellence of their design.

Even if we do not accept Mallet's mortar as a fact, there can be no doubt but that 2-feet shells will be thrown in the next war. My own conviction is that a 3-feet mortar will be accomplished ; but, whether or no, any fortress before which even a 24-inch mortar can be placed will certainly

be irretrievably breached if it depends on a single rampart for its defence, and that rampart stands on the frail prop of a masonry revetment.

Some larger and very different treatment of the subject has now become indispensable, whether in the path I have attempted to point out or in some other remains for you to decide; but one thing I think all must admit as certain, and that is, that fortification cannot now remain where it has been for the last two centuries. Not only is a larger treatment required, but areas must be inclosed which were hitherto undreamed of. A radius, recollect, of five miles—the range of Armstrong's gun—is a circumference of thirty, and that we must take in if we would render our towns free from bombardment. A revolution in warfare is at hand, and that country will have the advantage in the fight that first grasps the new conditions of the problem.

In conclusion, allow me one word, though that word is principally personal to myself.

All I ask of you, gentlemen, is what I asked on a previous occasion, and that is criticism, generally a cheap enough article. What I want is that the grounds of my proposals should be sifted. If they are based wholly on error, if there is some fatal mistake which vitiates the whole, nothing surely can be so easy as to point it out. It ought not to require ten years to hit the blot in so plain a proposition. If it can be so, let it be proved if it exists, and let us both forget the subject, for the present position of it is not creditable to either of us, and the sooner it is in that case forgotten the better for both.

But if it is that there is some good and some bad in what I have proposed, let the chaff be sifted from the wheat,—and what is good taken, what bad rejected. But if it really is, as I suppose, that my proposals are right in the main and only open to certain objections of detail, let it be acknowledged that it is so, and let us see if those objections cannot be removed, as I believe they can be easily, and do not let us go on teaching and practising what is obsolete and useless when the very existence of our country may depend on the proper application of this most important art.

CHAIRMAN: I am sure that I shall only express the sense of this meeting, in saying that we are deeply indebted to Mr. Fergusson for the very clear and able manner in which he has brought forward his system of fortification. I do not intend to offer any observations upon it myself, but I believe there are several officers present who desire to make some remarks. Colonel Wilford, I believe, is one.

Colonel WILFORD, R.A.: I would beg leave to make a few remarks, and I will proceed to mention a few of the difficulties which have occurred to my mind in listening to the views and to the reasoning of Mr. Fergusson; but, before I proceed to do so, I ought to say that I consider great benefit will be derived from the discussion of the points and questions which he has mooted, and I think we owe him a great deal for the time and attention which he has devoted to the subject. Having said thus much, I shall in the first place make a few remarks upon the bastion system. I admit that Mr. Fergusson has faithfully described it; but then we must consider that the first principle of fortification is the art of enabling a few men to defend themselves against a much greater number; and, therefore, the primary idea of a bastion system is to enable a few men to place them-

selves in security, and to resist for a certain time a much greater number, and meaning by "greater number," not only a greater number of men, but that greater number of men possessing a greater power of artillery, which must be assumed to be the general condition of an attack. If we are to conceive a large state having extensive frontiers, and many points to occupy, the strong places must all have garrisons and be prepared for defence, for they cannot know upon what frontier they will be attacked. It will always be, as a general principle, conceded, that the besieger, who chooses where he shall attack, will be able to accumulate a much greater amount of means than any state can have at its command at every point of its frontier. In a great empire like ours, we may have a few points, such as Portsmouth and Plymouth at home, and we may have Gibraltar and Malta abroad, where we may accumulate immense means; but, generally speaking, it can hardly be done. Hence, taking, for example, an octagon or any smaller work, I would contend this generally, that whether it be the bastion system, whether it be the circular system, or any other system approaching it, it will be impossible to prevent that great and essential advantage, which will lie in the hands of the besiegers, of a concentric attack, and so embracing the defence. For example, looking at the model on the table, supposing that on any one side of it—at a distance of 1,000 yards—there was a line of batteries, the fire from which would converge and cross upon the defenders—then, whether it be the bastion system or the circular system, that general advantage must lie with the attack. In comparing the advantages of different forms of construction it is necessary, having no other mode to resort to, to calculate the number of days which under the given system the defence would last, such calculation being independent of the courage of the garrison, which would tend to modify it; but the assumption is, that, if there is a very great superiority in the fire of the artillery on the side of the attack, it must succeed. That must be the general result; but there are no doubt exceptional cases, as at Sebastopol. There we had an immense fortress to deal with, occupied by an army as strong, if not stronger, than the attacking army; and again, that army having free communication with its own country both parties were on an equality. Again, if we suppose a fortress something like that of Antwerp, it being generally of a circular form, and the diameter very great, any given portion of the *enceinte* approaches a straight line, and some advantage will then arise to all systems, even to the bastion system, for, in that case the salient angles of the bastions become so obtuse, that the embrasures can be directed in the direction of the capitals of the bastions at will; and again, some points can be made curved. I shall not attempt to go into every point, but I will address myself to the question of enfilade; and I will refer to the model. This (pointing to the model) is the salient angle of the bastion. This line (describing the same) is prolonged, and a battery is made perpendicular to that prolongation. Some guns, I will suppose, are placed at this point (describing the same), and it would appear, that every shot would go along the *terre plein*, and strike the guns; but we find that the shot goes into the ditch, and it is very difficult to hit the guns. I do not mean to say that ricochet firing, combined with direct firing, and the fire of mortars, on the part of the attack, is not embarrassing to the

defence, and generally in the end does not wear out a garrison, but it does not tell, as is supposed. On the other hand, it is supposed that a work, the outside of which is curved, would escape this ricochet firing. I will suppose an attack to be made against this model before us. Suppose a line of works at a thousand yards distance from the *enceinte*, or at any distance that is possible—suppose there is a battery placed where I am standing in the direction to which I am pointing, there will be a general ricochet over the whole of these lines [pointing to the same], the shot will rise, leaving the muzzle at five or six degrees of elevation; although the velocity is small, still the angle of descent is rather greater; and supposing a number of shot and shell coming down in this direction, some would graze the crest of the parapet, and some would take it obliquely; some would ricochet at that part, and some would take it in reverse. Therefore, practically, I believe it would be rather easier than more difficult to procure a general ricochet on these curved lines [pointing to the model], and the general advantage would be with the attacking party. With regard to Mallet's mortars, which have been just alluded to, I think that the inventor has tried to take too great a step at once. If he had constructed one of half the size, he might have succeeded. It is true that one firing in this or that position [describing the same] would not produce a breach, but suppose that a shot fell at that point, it would blow down that *escarpe* as in the bastion system. With regard to artillery, there is no doubt it is true that if you can so contrive a work as to be able to place your artillery on the same footing, and having the same advantage as the attacking party have, and the defenders have as much artillery, then it is one man against another, but there is great difficulty in doing it. I will endeavour to bring it in a practical way before this meeting, looking at an estimate of the expense, and taking into account 32-pounder guns. I calculate that the expense would come nearly to £1,000 a gun, that is, a gun and a thousand rounds; one hundred guns therefore would cost £100,000. I mention this to show the immensity of the thing. To work a heavy gun effectively, you would require at least ten men to a gun, seven of them to work it, and three at least for filling shells, bringing up ammunition, &c. Then you would require three reliefs, and that would make thirty men to a gun. Therefore one hundred guns would require 1,000 men, and three reliefs would make 3,000 men. It will perhaps be said that you may have auxiliaries, and that the men need not all of them be good artillermen. I should say, in answer to that, that at least one-half of them ought to be trained artillermen. Therefore, I conceive that it will be practically found impossible for any State to accumulate such a number of guns, ammunition, and men, as to make it possible for them to have a number equal to those which the enemy might bring to bear against certain points. Of course, with regard to a place like Portsmouth, you might accumulate such means of defence, as to be equal to what the Belgians may have at Antwerp. There is a further point worthy of notice, which is this—that although these *escarpes* [pointing to the model] cannot be seen directly, they may, under a certain combination of fire from batteries, be very seriously injured by the curved fire of very heavy projectiles. I happened to witness the breaching of Carnot's wall. After the great Revolutionary War, England agreed to rebuild the barriers of the Netherlands; and the Duke of Wellington, who

was consulted in the matter, approved of erecting fortifications under the old system—but the Prussians said that we were wrong. They said, “ You should adopt Carnot’s system;” and the Duke of Wellington is reported to have asked the late Sir Alexander Dickson for his opinion, and he said at once that Carnot’s detached *escarpe* could be breached. I was employed in the preparatory experiments, and I afterwards saw Carnot’s wall breached in one day. That shows the difference between theory and practice, although I, at the same time, give every credit to Mr. Fergusson. There is another point, viz., “ earthen parapets.” Every engineer, certainly every artillery officer, will argue strongly for earthen parapets. It may be necessary to have, and often is, *escarpes* of thirty feet of masonry, and, as arms are being improved, they must be made strong in proportion. There is no doubt that we are on the eve of great improvements in artillery, and great merit is due to Sir William Armstrong for his invention. At the same time I will say, that his guns, on a large scale, are not yet made, and experience has taught me that nothing is certain in artillery till the thing is actually done; and, although a small gun may succeed, yet the plan may not answer on a larger scale. It is yet to be seen what the experiments will be.

Major JERVOIS: I think, that in order to do justice to the subject which has been brought before us this evening, it would be necessary to have the report of Mr. Fergusson’s lecture before one. There are many points upon which, although I am not here as an opponent to Mr. Fergusson, I cannot but say that I disagree with him. For instance, as to his mode of his putting the question of masonry *versus* earthworks. It was mentioned by Mr. Fergusson as if the adoption of earth was new. That we know is not the case. Ever since the invention of gunpowder, earthen parapets have been used. Again, the comparison between Bomarsund on the one hand, and Siliestria and Sebastopol on the other, is not to the point. The landworks at Bomarsund consisted of three or four masonry towers, all entirely above the ground, which were of course breached soon after batteries were opened against them. But the same thing would not have occurred there if the works had been constructed with sunken escarpes and with earthen parapets, the latter only appearing above ground. With regard to Siliestria, the works there were simple field works, and the same may be said of those at Sebastopol, although at the latter they were more considerable. The observations, then, of Mr. Fergusson, with respect to the sieges of these three places, have no reference to the consideration of his system. The case of Bomarsund was not one of works constructed according to any system which an engineer would adopt, as against a regular land attack. I have been informed that the works at Siliestria, referred to by Mr. Fergusson, had ditches only about eight or ten feet deep, and parapets of about the same width. With regard to the works at Sebastopol, their defence depended, not upon the construction of the works, but upon the enormous means for their defence, both in men and material, which the Russians possessed, and upon the facility with which they were enabled to receive reinforcements and supplies during the siege. Mr. Fergusson referred to some works now in course of construction in this country; and he said that they were works such as he would himself have designed. They are not however according to his system—they do not

resemble it in any particular, and this leads me to think that if he were to detach his principles from his system, we should come to a better understanding ; and he would find that if he came to practice, he would agree with military engineers of the modern school. There are certain things about his system that I think may be called crotchets. I think that the mode in which he proposes to apply several tiers, is a crotchet. I think also that it is a crotchet to insist on curved lines as he does, for practically there is but little difference between a curved work and a polygon, the faces of which bear in the same general direction as the curve.

It appears to me that the polygonal work has the advantage, for you have straight lines, which are more easily flanked. In the case of the curved line you have to make your *caponieres* longer than in the polygon, in order that they may perfectly flank the ditch. The straight lines, too, are cheaper in construction. With regard to the tiers, if in a long line, or in a large fortress, you choose to go to the expense of digging your ditch deep enough, and wide enough, and if you place your tiers sufficiently behind one another, that they do not incommod the gunners on the front line by shells bursting against the parapet behind them, I do not see the objection to a second tier, or, perhaps, even more *in certain cases*. But with three or four tiers in a fort of moderate size, you would have no interior space, or scarcely any. Suppose a polygonal fort of say fifty guns with tiers, as Mr. Fergusson proposes, you would have scarcely any space inside ; unless the fort be of great size the rampart would fill up the interior space. Practically, it will be found that in planning works, say of the size of the detached forts round Paris, Lyons, and many of those about Coblenz, or the advanced works proposed by the Belgians, in front of Antwerp, even if it were desirable, the system of tiers could not be adopted. I commenced by observing that, in order to enter satisfactorily into the subject, it would be necessary to take the several points mentioned by Mr. Fergusson, and to come prepared, as he has come prepared, with a well digested lecture. As I have already stated, I do not appear here as an opponent of Mr. Fergusson ; on the contrary, I heard what he advanced with much pleasure, and I admire him for taking so much trouble, and for devoting his time to the consideration of fortification. It is the astonishment of many what should make him enjoy it so much. But as we have an Armstrong, who has done a good turn for the Artillery, and have had a Reid, who has done a good turn for the Navy, in considering the theory of storms, I do not see why we should not have the benefit of Mr. Fergusson's observations on fortification. I think that we should feel indebted to him ; I am sure I should always be glad to take counsel with him ; and, although there are particular points which he has got in his head, which I call crotchets, I do not think that in putting principles into actual *practice* we should be found materially to disagree.

Colonel WILFORD : I beg to say that I know many officers of artillery feel greatly indebted to Mr. Fergusson for the questions that he has mooted, and I must say that I cannot sympathise or agree with Major Jervois in describing the ideas of Mr. Fergusson as crotchets. I think they are the ideas of a man of great talent, although I do not altogether agree with him.

Major JERVOIS : I meant the particular details of the system.

Colonel WILFORD: I do not agree with you. With regard to the tiers, I believe, and I say it on the authority of officers who served at Sebastopol, and their belief is, that it would not be possible to fight these tiers simultaneously; particularly if shell guns were used; the men in front would be embarrassed by the effect of the fire and the burning wadding, and I doubt if you would get men steadily to fight the front tier, when the tiers behind were in action.

CHAIRMAN: Some questions relating to artillery have been discussed, and particularly with reference to improved artillery. I am happy to observe that Sir William Armstrong is present.

Sir WILLIAM ARMSTRONG: Sir, I have listened with very great interest to the lecture of Mr. Fergusson, and it certainly strikes me, from the respectful attention with which Mr. Fergusson's principles and arguments have been received—indeed it adds to my own experience an additional assurance, that emanations from civilians are not received by military and naval men in a depreciating manner. It would be mere presumption on my part to attempt to enter into the discussion of a subject which is entirely new to me. I can only discuss it in connection with that particular species of artillery to which I have given my peculiar attention. I do not know that it is open to me to say much on this occasion that would be interesting, further than with reference to the practicability of constructing large guns. That I consider to be a settled matter, and we shall infallibly have guns of a very large calibre upon the same principle—in fact, guns of that character are already far advanced, and I have no doubt whatever that in a few weeks we shall have one in operation. I am satisfied also that the effect of shells from guns of this kind will be to level any species of earthwork. I think also that they would effectually prevent the restoration of a damaged surface, and that is a matter to be considered, with reference to a system of the kind which has been described. Another point I may mention which is peculiar to long range artillery, that you will get an effective breaching fire, with a very curved trajectory, so that you will require a much higher screening place than heretofore to protect the besieged works.

Colonel WILFORD: I should like to ask you, Sir, what has been the penetration of the shells manufactured on your plan, that have been fired into earth.

Sir WILLIAM ARMSTRONG: The shells are caused to explode at such a depth as is calculated to produce the greatest effect, from six to seven feet. They explode percussively, at a depth of six or seven feet; and with a large shell, the displacement of the earth would be very complete, except upon a very extended surface; but a continued fire of shells on a face like that in the model would infallibly level it unless the screen was very high. At 2,500 yards the descending curve of the projectile would be about one in eight, and you would require one yard in eight to cover it. Eighty yards would require ten yards high to cover it. There is no difficulty in maintaining a fire upon a breached surface at night, with the same effect as in daylight, and that must be taken into account with reference to the practicability of restoring earthworks of that kind.

Colonel WILFORD: Does it strike you that your newly-invented guns

will re-establish the equilibrium of the defence—that is to say, make the defence more certain than it is now?

Sir WILLIAM ARMSTRONG: That is a question of too technical a character for me to give an opinion upon; but I would say this in favour of earthwork generally, that I think it is the most effectual means of resisting guns of that kind. It has the advantage of being more readily restored than anything else, although I think that any species of defence would be very difficult to restore under the fire of such artillery.

Mr. FERGUSSON: I do not know that it is necessary for me to go into all the points which have been referred to; but with regard to what Colonel Wilford has said, one great point that he made, as I understand him, was the expense of such a number of guns.

Now the fact is, that a fortress of the ordinary construction, on the bastion system, has a great number of guns, nearly as many as I would ask for, and every gun must have ten men, and so on.

Give me the same number of guns as are put into an octagon of the ordinary construction, and I am content.

What I complain of in the bastion system is, that the guns are some to the right and some to the left, and some north and some east and some west, but not looking towards the enemy. Now all I want is that every gun shall point to the enemy. If that is done, it is all I contend for; and what I pretend to do, in this mode of facing the enemy by curved lines or any others, is simply that the guns, instead of being left and right, and being enfiladed, shall face the enemy, and shall not be enfiladed. With regard to blind fire and enfilade, the point is, that in the bastion system you can enfilade at from 600 to 1,000 yards, and the fire of the enfilading battery cannot be answered from the fort. But, in attempting to enfilade the lines of even such a fort as this shown in the model on the table, your enfilading battery must be placed at least 2,000 yards from the point to be enfiladed, and is within 1,000 yards of the guns of the fort, which are practically enfilading the attacking battery; so that in fact this mode of construction practically turns the tables on the attack. It is now the besiegers' batteries that expose their flank to the enemy, and become enfiladed instead of enfilading. With curves flatter than those used for an octagon the enfilading batteries must be placed at even greater distances; and with such curves as practically will only be used in future fortification they must be placed at 3,000 to 4,000 yards distant, and occasionally even more, and their flanks be practically at right angles to the fire of the fort.

Supposing Sir W. Armstrong's gun to be used, a larger treatment will be required than that shown in this model, but the principle would be the same. There is a point with regard to the number of forts which Colonel Wilford assumed would be used. That is however a strategic point, and does not belong to the subject of fortification, of which alone we are now treating, and it is a point that has been pretty well settled in Belgium, as, after erecting some 30 fortresses, a barrier of fortifications along their frontier, after the peace of 1815, they have now destroyed more than half of them, and one half of the remainder are condemned; for they find that the plan of having a number of forts and guns is all nonsense, and they

have determined to concentrate their whole defence in Antwerp. But, as I said before, that is a strategic point, which I particularly avoided entering upon, as it was not a point to be brought forward to-night. With regard to Carnot's wall at Woolwich, the whole of the top of which was above the level of the country, all I say is this, and that goes to the remarks made by Sir W. Armstrong, that in the bastion system all the walls are above the level of the country ; and if Sir W. Armstrong can, which I do not mean to dispute, breach a wall the top of which is 30 feet below the level of the country, he can much more easily breach one that is 10 feet above the level of the country. I can throw up earthworks in my ditch because I have room—because it is not seen by the enemy ; but in the bastion system it is visible, it must be seen, and therefore it can be more easily breached than the other. With respect to what Major Jervois stated as to Siliستria and Sebastopol, I do not wish to enter into that, as I have not the data. I prefer waiting, as I said before, until we have the actual documents, which are in the press now. All I would say at present is, that what has occurred as far as it goes is in favour of a system of earthworks. Major Jervois admits that a polygon of a high number of sides is equal to a circle, and *vice versa* ; but if you take this work, which Major Jervois has drawn, there are 10 guns on one side and 10 guns on this front, and if I can put 30 or 40 guns opposite them anywhere in the field I do not believe it is possible for those 20 guns to resist. I am certain that they can be overpowered. The question with me as to fortification is this,—if the enemy can bring a greater number of guns to bear against a work than the work can bring to reply, that work must eventually be destroyed; and what I ask is,—are there any means by which that defect or that disadvantage can be remedied? I suggest a means. I do not mean to say that is the only means, or the best means, but I say here is a means. Montalembert proposed the same thing as I do, but he did it in masonry, and his system was in consequence open to many objections. At Bomarsund it was tried and it has failed, because masonry will go down. Montalembert's principle was right, but it has failed in practice, in consequence of using a material that will not resist the effects of artillery. I suggest a means of doing it by earth. Unless some other means can be suggested by which that defect, namely, the inferiority of the fire of the fort can be remedied, I am afraid fortification must remain where it has been during the last two centuries ; and there is nothing, so far as I can see, that will do it except meeting the enemy face to face. If it can be done by tiers of ramparts, well and good ; if not, I shall be glad to hear any other suggestion that will meet the difficulty. Major Jervois objects, not to my principles, but to what he calls certain crotches. But let us have something better, and let the criticism of this system be the suggestion of a better mode of meeting those difficulties which I attempt to meet. In the meantime it is a system that pretends to meet certain difficulties, and if any one can improve upon it I shall be too happy to give way, and to confess that I am beaten.

Evening Meeting.

May 21st, 1860.

Colonel P. J. YORKE, F.R.S., in the Chair.

The Chairman announced that Two Life and Eight Annual Subscribers had joined the Institution since last Meeting:

LIFE.

Bliss, Henry Baron de, late Capt. 4th Royal Atkinson, J. B., Ensign 1st. Royals.
South Midlx. Mil.

ANNUAL.

Palms, J. P., Comr. R.N.	Raikes, Rob., Lieut. 1st Brecknockshire
Ballard, J. A., Col. Beng. Engrs. C.B.	Rifle Vol.
Kelly, W. D., Lieut. late Roscommon Militia.	Dickson, J. B., Capt. R.N.
Bastard, B. J. P., Lieut. late 9th Regt.	Miller, Fredk., Major R.A.
	Black, Wilsone, Capt. 6th Regt.

Also, that Seventeen Members had raised their Subscription from Ten Shillings to One Pound, and that one Life Member had paid a further composition.

PRESENTS.

LIBRARY.

Books.

Le Mystère de la Croix de Jésus Christ et de ses Membres. 1 Vol. 8vo. Reprinted
1859. *Presented by Captain William C. Caldwell.*

General Sir Robert Gardiner, R.A., G.C.B.—Political and Legislative Considerations
on National Defence. 2nd Edition. 8vo. London, 1860. 3 copies. *Presented by the Author.*

Maps, Plans, Drawings, &c.

Maillard's Chart for determining the difference in Time or Longitude in all parts of
the world by a simple bearing of the Sun or other heavenly body. 3rd edition. *Presented by the Author.*

Sketch of Sevastopol during the Siege of 1854-55, taken by a Turkish Officer.

Presented by Lt.-Col. Hough.

MUSEUM.

Military.

Two Rifles from Kerets, on the western shore of the White Sea.

Presented by Captain Ommaney, R.N.

Scinde Powder Flask and Shot ditto.

Presented by Mr. Wemyss.

Five Hungarian "Liberty" Weapons.

Presented by the Commissioners of Police.

The Sword used by Lord Nelson when boarding the San Josef off Cape St. Vincent.
It was given by Admiral Sir Alexander Ball to Dr. Roots, of Kingston, and remained in
his possession till his death, when it was presented by his son Ludlow Roots, Esq. to
Vice-Admiral Sir G. Lambert, K.C.B.

Presented by Vice-Admiral Sir G. Lambert, K.C.B.

Miscellaneous.

Medal for service in Mysore, A.D. 1791-92.

Presented by Lt.-Col. J. F. D. C. Stuart, Grenadier Guards, M.P.

* ON THE PRINCIPLES OF FORTIFICATION ADVOCATED
BY MR. FERGUSSON.

The CHAIRMAN.—I have now to ask Captain Tyler to read his paper on Fortifications. You will remember that Mr. Fergusson read a paper upon the subject last year, and it was arranged that a reply should be given by some gentleman; but owing to circumstances, the parties not being able to meet, it was put off. The great object of these discussions is of course the elucidation of truth, and not the triumph of either a person or a party; and I hope that, by the full discussion which has been and will be given, we may arrive at some distinct opinion and conviction on the subject.

Captain Tyler then read the following paper:—

About this time last year Mr. Fergusson favoured this Institution with an evening paper upon the subject of his system of fortification, the reading of which was followed by a discussion carried on by adjournment to a subsequent evening. I was sorry to be unable, in consequence of absence from London, to attend either at the reading of the paper or at the discussion upon it; but I was afterwards requested by the Council to prepare a paper in reply to it. I consented to do so with pleasure, quite as much for the sake of an additional inducement to study the subject as to comply with the wish expressed; and I was furnished with a printed copy of Mr. Fergusson's paper, and with a manuscript copy of what others had said during the discussion upon it. It became, however, too late in the year to continue the subject in the same session, and in the meantime I devoted such leisure time as I could command to a careful consideration of the effects which rifled guns and muskets would be likely to produce upon the principles and practice of fortification.

In the present session, I determined upon *first* laying my own views before the Institution, as I had the honour to do in a lecture on the 2nd of March last, and *afterwards* continuing the discussion on Mr. Fergusson's paper; and I think that this was the fairest and most satisfactory course to pursue. In adopting it, I desired to state, as far as my own opinion was concerned, not only what principles we should avoid, but also, in contradistinction to them, those by which we should be guided in future constructions. Any who may feel inclined to do so will thus have an opportunity of discussing the principles that I have put forward, at the same time with those other principles which Mr. Fergusson and his supporters conceive to be correct.

In the paper to which I now reply Mr. Fergusson commences thus:—“It is now as nearly as possible six years since I had the honour of addressing an assembly in this place upon the subject which I am going

* It was expected that the present paper would have followed Mr. Fergusson's Lecture (which precedes it) in 1859; but the revised proofs of that lecture could not be furnished to Captain Tyler before July, and Mr. Fergusson stated that he would be unable to attend at the Institution after the 1st of August in that year. It was therefore postponed for the current year; and the two papers, with the discussions upon them, are now given *seriatim*.—ED.

to broach this evening; but I am bound to say that I have very little to add to what I then said regarding it. Perhaps it will be considered somewhat conceited in me to say so, but I have seen no reason to alter my views; for, though there is no doubt that great progress has been made in the subject since that time, all that has passed has only tended to confirm me more and more in the correctness of the views I then enunciated. I now in consequence feel so strongly confirmed in them, that I cannot but feel that I may be justified in bringing them again before you, more especially at the present time, when everything concerning fortification is of such intense interest that I am sure I need make no apology for so doing." And he then proceeds to say: "I may also add, that, during the ten years which have elapsed since my work on fortifications was published, no one has pointed out where the error was in what I then brought forward. There has been a good deal said about details, and I do not mean to say that it was not more or less correct; but the fact that the great principles which I then proposed have been unrebutted, I believe I may say is unquestionable."

From these extracts I may, I suppose, conclude, that Mr. Fergusson admits the correctness of some of the criticisms that have been advanced upon the details of his system, but that he still adheres implicitly to his main principles, and considers that nothing has been said to refute them.

He has certainly in some measure altered his details in his later diagrams.* He has, for instance, omitted the barracks, which he designed in the first instance to stand on the summit of the made earth of which his ramparts were composed, and placed them in a better position under his ramparts. He has in his last profile omitted the *fausse-braie*, on which he at first so strongly relied. He has adopted counterscarps, which he formerly rejected on account of their expense. He has admitted that it may be desirable to have straight revetments instead of curved ones, though he still appears to advocate curved ramparts. He has filled up the earth behind his detached wall to give it additional strength, and he has thus abandoned the demi-Carnot wall which he at first advocated.

But I do not wish to insist upon any alterations of this description, or to tie him down in any way to questions of detail, important though they be. I desire to meet him in the fairest manner upon his own chosen ground, and to discuss the prominent questions of main principles on which he principally relies, and to which he adheres. I believe that it is with regard to these main principles that he is most in error, and that his errors in these respects are those which would if they were adopted be the most injurious.

If I thought that those main principles were correct, it would give me great pleasure to say so, and to co-operate with Mr. Fergusson, as far as I could, in making the details perfect. As I conceive them to be erroneous, I will spare no pains in endeavouring to convince him and others of the mistakes that they contain, and to demonstrate what I believe, after very careful study of the subject, to be the correct principles upon which we ought to proceed.

I concur, indeed, with Mr. Fergusson in believing that none of the

* Compare the diagrams at pp. 183, 184, with that at p. 186 of Mr. Fergusson's *Lecture*, and with the profiles given in his "*Essay*."

systems of fortification which have been proposed or adopted since the invention of gunpowder are perfect, though I think that he has exaggerated some of their defects. I am convinced that many of the principles, even, on which they have been designed or constructed, must be altered, or materially modified; and that this is particularly the case now that superior weapons are coming into use. At the same time, I conceive that the alterations which he has proposed are not adapted, either to the weapons which we are abandoning or to those which are to supply their place, and that alterations of a more radical nature, in what I may call an opposite direction, will in the end be found to be necessary.

The defects of the French system are those on which Mr. Fergusson loves most to dwell, and he leaves the errors of the systems that have been adopted of late years by the Germans as improvements upon them, and that have received more general approval upon the continent, comparatively in the background. He even adopted, in the first instance, some of the defects which they introduced into practice, namely, the demi-Carnot wall, and the unrevetted counterscarp, which had the disadvantage of laying it still further open to the effects of distant fire from the front. It is impossible to admit the correctness of what he says with regard to the best of bastioned fortresses, that they are open to a "mode of attack (p. 180 *Lecture*) by which, without risk or danger to the besieger, the fort must fall into his hands within a certain limited number of days." The history of past sieges certainly does not bear out this assertion. In order to admit it, it is necessary to ignore all the difficulties under which besieging armies have laboured, the losses that they have sustained, the checks that they have received, the delays that they have undergone, and the failures that they have experienced, in the siege of regular fortresses during several hundred years.

But I shall pass lightly over this, and altogether over many other matters in which I cannot agree with Mr. Fergusson. I will only refer you for the present to my recent lecture at this Institution, and to a paper which I have supplied for the volume of the Royal Engineers' Professional Papers now being published, for the principal defects, both of the French and German systems, and for the principles upon which I believe they ought to be remedied; and I will come at once to those main principles of fortification, by the application of which he believes that impregnable works may be constructed, and that the defence may be rendered superior to the attack.

Those principles are easily understood. The chief of them is that which was so strongly advocated by Montalembert,—of increasing the artillery force of the garrison, and of enabling it to oppose at all points several guns from the fortress to any one that the besiegers can bring against it. Mr. Fergusson says with regard to his own system (at p. 43, *Peril of Portsmouth,*) "Gun for gun, the defence is superior to the attack, from the height at which some of the guns are placed, and the grazing fire that can be obtained from others; from the consolidation of the parapets by time, and also from the fort being able to use guns of far heavier metal than can be brought to bear against it: so that if the fort could only reply with the same number of guns it must obtain the victory. But it can always command twice or thrice or four times the number, so that battering by artillery will not avail."

But there is a great difference between them in their applications of this

principle. Montalembert based *his* circular system on the following principles: 1. That his fortification ought to have no ditch, or rampart of earth, because it would thus be more expensive than if he employed masonry. 2. That, instead of the usual earthen ramparts, there ought to be an enceinte of gun-casemates, constructed of masonry, placed altogether above the level of the ground, and raised to a height equal to that of the rampart of a bastion system above the bottom of the ditch in front of it. 3. That this enceinte of casemates should be armed with a numerous artillery, whose great elevation should give the power of concentrating an enormously powerful fire upon all the works of the attack, of which it should render the progress impossible. 4. The importance of this enceinte of casemates in a defensive point of view would be the greater, in consequence of its having little to fear from ricochet fire,—the most effectual of all modes of attack.

Mr. Fergusson on the other hand exaggerates greatly, as I shall presently have occasion to show, the proportionate expense of masonry; he believes, with all those who have raised objections against Montalembert's designs, that exposed masonry in a fortress is too easily destroyed; and he proposes to attain the same end, of rendering successful attack impossible, in a more effectual and economical manner, by placing several tiers of earthen ramparts, one behind and one above another. It is not a little singular that Montalembert should thus have adopted tiers of masonry casemates to save the expense of earthwork, and that Mr. Fergusson, in advocating the same principle, of a preponderance of artillery fire at all points on the side of the defence, should have adopted tiers of earthwork to save the expense of masonry.

The second principle partly depends upon the first. These tiers of parapets mount to a height of 48 feet when three, or 64 feet when four of them are employed, above the level of the ground; and deep, wide ditches become necessary, in order to obtain the earth for their formation. Accordingly, when wet ditches are available,* they are to be made 200 or 300 feet, or, on an average,—say 80 yards wide; they are to contain water, 12, 15, or 20 feet deep; and they are to have no masonry revetments. When dry ditches are used, the escarp, or the escarp and counterscarps, as shown in the latest profile, are to be sunk to a depth of 30 or 40 feet below the level of the country, so as to give a total depth of 60 or 70 feet; and the ditch is to be from 50 to 100 yards wide.

The third principle consists in the employment of circular, in place of rectilinear, forms. Mr. Fergusson considers, that "many, if not most, of the disadvantages of the modern systems have arisen from the necessity of using straight-lined forms;" and he prefers circular forms, because they are the cheapest; because a circle incloses a larger space than any other mathematical figure; because it is simple; because it is more easily handled and adapted to uneven or irregular ground; because it is more easily understood, especially by undisciplined troops; and because it is the only figure which can be made equally strong in every point;—apparently cogent, but really very erroneous, reasons. I shall presently have occasion to show that circular forms applied in this manner are by no means the cheapest. They inclose the smallest possible, instead of the largest, interior space in

* Vide section at p. 183, and plan at p. 184.

Mr. Fergusson's system, because, in the inside of a bastionary, polygonal, or other trace, there are tiers of ramparts of very considerable dimensions appropriating a large proportion of that space. And, while the system is simple in theory, it would be exceedingly complicated in practice, and would involve, as I shall also have to show, the employment of enormous resources.

These, then, are the three main principles of the system proposed by Mr. Fergusson. They none of them, when taken separately, originate with him. Circular forms have been used from the most ancient times. Circular systems have been invented almost without number. Earthen ramparts in double tiers were used, for instance, by Speckle in 1589, by the Dutch, and in the bastion system of the Italians; they have since been employed, in the form of cavaliers, in bastioned systems; and Choumara shows in his work pretty much the same profile as that employed by Mr. Fergusson. Wet ditches, also, were principally used without revetments in the Low Countries in former times; and earthworks formed the great resource of the Romans. But the combination of these details into a general system in the form suggested by Mr. Fergusson, is, as far as I am aware, new in this country; though he tells us that a system very similar to it was proposed in Germany by M. Wittich in 1840, and afterwards abandoned. These principles, taken together, make up a circular sweep of fortification, or a circular fort, composed of three or more tiers of earthen ramparts, one above another, surrounded by a very large ditch, either containing a considerable depth of water, or protected by revetment or other walls sunk 30 or 40 feet below the surface of the ground; and these ramparts may be placed, as it were, on the top of an enceinte, of the French or of the German system, either of which he is willing to accept for the defence of his ditch. The system thus made up, besides being supposed to possess the great advantage of impregnability, is also recommended on account of the cheapness, as compared with other systems, with which it might, Mr. Fergusson believes, be constructed.

In considering the principles before us, I will commence with the most important of them.

It is a very proper question to discuss in the first instance, whether it is possible, or how far it is practicable, to give to the garrison of a fortified place a preponderance of artillery fire on all points from which it may be attacked, or to provide it in any way with the means of maintaining a superiority over all the guns that can be directed against any portion of its defences. This is the object that Montalembert desired, as I have shown, to accomplish in masonry, and for which he contrived, in his circular system, to direct the fire of 328 guns upon every point within 500 yards of his works. This is the object, also, for which Mr. Fergusson proposes to employ so many tiers of earthen ramparts; three or more on a larger circumference, four or more on a smaller one, besides the *fausse-braie*.

To this question there ought to be a reasonable answer, and yet I am bound to say that I have not hitherto seen it satisfactorily replied to. We are told upon eminent authority, that the aim of a good defence is not to provoke an artillery contest with the besieger; that a good defence does not consist in loading the ramparts with artillery; that artillery is expensive, costing 1,000*l.* per gun, including its 1,000 rounds of ammunition, or 100,000*l.* per 100 guns; that 1,000 men would be required to man every

100 guns, and so forth. But these reasons do not seem to be as conclusive as is desirable.

Five hundred guns, with their ammunition, would thus cost, no doubt, half a million of money, and would require 5,000 men to man them; and these alone would be very serious objections to their employment in all cases for opposing (say) 200 guns on the part of the besieger. But the other points referred to are mere assertions, which do not come home to the mind, without further explanation at all events; and the subject is well worthy of full consideration. It is a grand, a simple, and a tempting idea, to place at the disposal of a garrison the means of destroying at once any batteries that can be opposed to them, whenever it may suit the pleasure of their commander to order them to their guns. Mr. Fergusson thus states this idea at page 45 of his *Essay*:—“ According to this mode of attack, we find some 50 or 60 guns dispersed in small batteries, extending half-way round the fort. If such a procedure were attempted against such a fort as I am proposing, it is probable the governor would take no notice of such child’s play; but, if a battery did make itself particularly obnoxious, it would only require an order to silence it, for three, four, or five times its number of guns could instantly be brought to bear upon it with every advantage of position in favour of those in the fort.”

But I will now endeavour to consider this question of the practicability of employing a greatly increased force of artillery in a more detailed manner, and in a way that will be plain to all.

In a contest between two ships, from which this idea of superiority of artillery fire has partly arisen, the issue depends very much upon three things:—1. The quantity and weight of shot and shell which each can deliver with the greatest precision in the shortest space of time. 2. The capabilities of the vessels and the manner in which they are manœuvred. 3. The skill and prowess of the commanders and their crews. But the contest is not of long duration; and almost all the hands on board can generally be employed while it lasts, either in the management of the vessel or the working of the guns, the greater number being devoted to the latter duty.

In an action between a ship and a coast-battery, the same sort of rule holds good. The contest is comparatively of short duration, and the object on either side is to disable the enemy in the shortest possible time.

But, in the siege of a fortified place, the nature of the contest, the means employed for carrying it on, and the objects to be attained, are altogether different. It is true that the ultimate aim of the besieger is the capture of the place, and that that of the garrison is to prevent its capture, as well as that artillery plays a very important part in the struggle; but the steps which it is requisite to go through in order to bring about the final result, are gradual; and a mere preponderance of artillery will not prevent a fortress from being taken on the one hand, nor enable the besiegers to capture it on the other, as I shall presently show.

There are two principal operations which the besieger has to perform in the course of his attack. The one is to construct a covered road up to the fortress, and the other is to pass the ditch by which it is protected. If the ditch be wet, he must either drain away or divert into another channel the water it contains, or else he must construct bridges across it. If it be dry, he must descend into it by galleries, form a breach in the escarp wall, and

proceed according to circumstances. At least these are the ordinary methods of attack, and these two operations, of forming a road up to the place and of crossing the ditch, are those which the garrison has mainly to prevent.

The first parallel of the besieger, and its communications, have usually been constructed before the commencement of his batteries, and a considerable portion of his trenches before he has obtained a superiority of artillery fire; and Mr. Fergusson does not propose, with all his artillery, to obtain much advantage in this respect. He says at p. 45 of his *Essay*, "I admit at once that the enemy cannot be prevented from establishing his first parallel. It is generally done by stealth, and sufficiently complete before morning to shelter his men, so that any attempt to prevent this, or disturb him in it, would require a waste of ammunition which would under no circumstances be justified."

Artillery fire, indeed, can only be partially employed with advantage for such a purpose, although I must add, that projectiles constructed on the principles employed in Sir W. Armstrong's improved *case*, will be capable of doing good service in this and other respects.

It is not by blowing away an occasional battery that a garrison can hope to stop their assailants. The besiegers are, or ought to be, constantly at work, constructing their batteries and advancing their trenches. When a portion of their works is destroyed they throw up more earth in other places, and they give continual occupation for the guns as well as for the musketry of the garrison, if they are opposed, as they ought to be, more or less according to the strength of the garrison, at every step of their operations. The guns of a garrison, to be of service in this respect, must be made constant use of. A vigorous cannonade, only applied now and then, however overwhelming at the moment, will have but a limited effect in retarding the besieger's progress.

The most convenient, economical, and effectual means, when it can be applied, of opposing the early operations of the besieger, and, in fact, of checking all those works on which uncovered workmen, or the method of flying sap, are employed, is by a plentiful use of musketry from convenient situations in advance of the place, for preventing their construction. The rifled muskets of modern days will be of very great utility in this respect. They will, in fact, have a tendency to render all such work in the neighbourhood of a place impossible, at least by daylight, and to compel the besieger to hide his workmen behind screens, or to employ them almost or altogether underground, where neither musketry nor artillery can disturb them.

When the besieger establishes his batteries, then Mr. Fergusson's guns come into play in the manner above referred to; and, to quote again from p. 45 of the *Essay*, the following would be, he thinks, the probable relative position of besieged and besieger:—"There is, however, no motive for dispersing the guns in this manner, in attacking this system, as there are no faces to be enfiladed; certainly not, at least, at that distance; and as all that is required, or indeed can be done, is to silence the fire of one front by direct fire from the first parallel, the besieger would probably concentrate his fire into one great battery opposite the front he proposed attacking. Supposing he put 100 guns into such a battery, the fort could easily bring more than 200 to bear upon it. If he put 200 guns into it, it must extend 4,000 feet, on which line it would be easy to direct 300 or 400 guns from

the fort. If he put 300 guns into it, his battery would extend nearly round one-third of the fort, so that one-third of its guns (or rather embrasures, 1,300 in number,) would point directly towards it, and the fort would have 426 guns to compete with it, supposing its guns could only fire on the exact radii of the circle in which they were placed; but, as embrasures always allow of a somewhat oblique fire, a much larger number would also be available here."

I may remark in reference to this passage that I dissent from Mr. Fergusson's arrangement of placing all the besieger's guns in one huge battery, because the besieger would thereby lose the greatest advantage which he possesses, namely, that of opposing a convergent to a divergent fire, and that I should prefer to disperse such guns as I employed as much as possible into the most convenient positions that were offered by the ground.

In any case, the trenches will advance with more or less facility and rapidity, as far as the artillery is concerned, according to the means that the besiegers can bring to bear for opposing or drawing off the fire of the garrison. I am very far from underrating the advantage of having, *as far as is practicable*, a superiority of artillery fire on the side of the fortress; but I wish to show that Mr. Fergusson is not warranted in resolving the issue of a siege, as he does almost entirely, into what he calls "a fight between the two artilleries."

The garrison, as well as the besiegers, have many other duties to attend to besides that of working their heavy guns.

During the investment of a fortress they are required to extend the circle of their observations in order to prevent surprise. Retreating as the assailants advance, they must break up roads, destroy bridges, render fords useless, and remove landmarks. When a reconnaissance is to be expected they have to keep anxious watch round the exterior, to prevent the besieger from deriving more information by personal inspection than can be avoided.

On and after the opening of the trenches, they have to retard to the utmost of their power the operations of the besiegers, by musketry and other fire, from advanced positions and convenient situations; to prepare against real and false attacks; to complete their preparations on the side attacked, as the besiegers' designs are developed; and to direct their embrasures on the besiegers' batteries, as these are established.

After the opening of the besiegers' fire, a vast deal of labour is required, for keeping the parapets, the embrasures, the platforms, the magazines, and the communications in repair, as well as for the construction of such temporary or additional works as are found to be necessary.

The various flanking works must be manned by sufficient garrisons by day and by night, and proper precautions must be taken at all points against a sudden attack. Sentries must be furnished for magazines and other works; there must be provision for hospitals, prisons, and for garrison duties of all descriptions; there may be counterminees to be worked; and a certain number of men must always be deducted as sick, wounded, or ineffective.

For the due execution of these numerous services it is necessary, in the garrison of a fortress as well as with an army in the field, that there should be a proper proportion of the different branches of the service; and, though this proportion will vary with circumstances, yet there is always a suitable proportion for each particular case.

In the working of the guns, it is true, the artillery may be, and are assisted by men from the line, or others told off for that purpose; but only a certain number of the garrison can be spared, according to its strength, for this duty; and there are always, as I have shown, numerous other duties to be performed which cannot be neglected.

There is thus a limit to the number of guns that can be employed offensively with a given garrison, as well as to the number of casemates or the extent of ramparts that can be manned; and if the magnitude of the works, or the number of guns capable of being employed (besides those which are required for the immediate security of the place, and in addition to what should be provided as a suitable reserve), be increased in a much greater proportion than the numbers of the garrison, then a useless expense is incurred, and an error is committed. That maxim also is broken, which is a good one where it is not too closely observed, that a fortress should not be supplied with much more of guns, ammunition, and military stores, than is necessary for a vigorous defence, because if it should fall the surplus might then be of great use to the enemy.

The proper proportions that ought in this way to exist in a fortress between men and guns cannot, of course, be absolutely determined. It depends upon the nature of the fortifications, upon their situation, upon their condition, and upon the different duties that may be required from the garrison in connection with them; but we may acquire a general idea of what it should be by referring to actual experience, which is the best guide, when properly made use of, that we can adopt.

As the result of experience, the following data have been given, from which the number of guns and the size of the garrison required for any fortified place may be calculated, and an average determined, in the case of different-sized fortresses constructed on the French system.

For every front of fortification there should be ten guns for the immediate security of the place; and, in addition, there ought to be about 110 for what have been called 1st, 70 for 2nd, and 30 for 3rd class fortresses. The garrison should consist, also, for the immediate security of the place, of 440 men for each front, comprising 350 of the line, 10 of the cavalry, 60 of the artillery, and 20 sappers; and twice this number should be added for the fronts susceptible of attack.*

A moderate proportion of men per gun, according to this mode of computation, would allow 40 men to every piece of ordnance for an octagon on the French system,—a second-class fortress, corresponding to what Mr. Fergusson has denominated his 1,000-gun fort. If the same data were taken, the garrison required for such a work as this 1,000-gun fort would be 40,000 men, instead of 6,000; and a greater number of men, as well as a greater number of guns, would thus be required for defending it than would be necessary, according to ordinary notions, for besieging it. Such an army ought not to be in need of fortifications at all, but ought to be able to encounter its enemies, equal or inferior to it as they would thus be, in the open field.

But the defensive armament is not here taken into account, though it is equal to the whole armament of an ordinary fortress; and, even if only half the usual proportion were allowed for the offensive armament,

* Vide *Aide Mémoire to the Military Sciences*, vol. i. p. 267.

the garrison required for that alone would still amount to 20,000 men ; and these ought to be able to defend themselves perfectly well in works embracing a greater extent of area, thrown up at far less expense, and altogether of a less formidable description.

This being the experience of past times as to other systems, the next question that arises is, whether there is anything in the system proposed by Mr. Fergusson which will lighten the labours of the garrison in other respects, and which will enable a larger proportion of it to be devoted exclusively to the service of the guns, in order to obtain a more powerful fire at any given point or points upon the assailants. In a system like that of Montalembert this might to some extent be the case. The men are securely lodged from the first in bomb-proof casemates, complete, and supplied with every requisite ; and though such a system would be very expensive in construction, and would require an enormous garrison to maintain anything like the fire which he desires to oppose to the besiegers ; yet there would be good accommodation for a great part of them, at all events, and a large proportion of them might be employed as artillerymen. But the fatal objection to this system (besides its expense and its unpractical nature) is, that it would inevitably crumble to pieces before even an inferior fire on the part of the besieger.

It is evident that in such a system as that of Mr. Fergusson, the labours of the garrison would, on the contrary, be increased in many respects. The more the tiers of ramparts were multiplied, and the greater the number of guns that were employed on them, the more severe would be the labour of maintenance and repair. The exposed position of the ramparts, and their collection together into a concentrated form, would render them the more liable to injury ; and their repairs would only be effected with considerable loss of life and limb, because the displaced earth would have to be thrown up on stages by exposed workmen from the exterior of the parapets. If the whole even of a small fortress, on such a system, were prepared and placed in perfect readiness in the first instance, with platforms, embrasures, expense magazines, bomb-proof communications, and all necessary means, and if a large proportion of casemates were applied over the whole of the works, then the expense would be very great, for works that might never be required ; and this is not apparently intended. In a long line of works of this description, such preparation would be quite out of the question. If the ramparts were not so prepared, then additional labour would be required to be expended in making preparations for the reception of the much greater number of guns that are to be used on any portion of the enceinte on which attacks might be made by the assailants. It would further be in the power of the besiegers to harass the garrison by means of false attacks, against which it would be necessary also for them to make preparations.

It is plain that, instead of a smaller, if anything a larger, proportion of men would be wanted in such a fortress for every gun that it contained, or rather for every gun in it that was intended for use, than has been found elsewhere to be required ; that Mr. Fergusson's 1,000-gun fort would require, therefore, a larger garrison than could be accommodated in the small interior space that would remain inside its ramparts ; and that the defenders, who would necessarily be employed in works constructed, and intended to be maintained, on these principles, on a large scale, would be

so numerous that very slight works ought to be sufficient for their protection, if, indeed, they would not be able to assume the offensive, instead of shutting themselves up behind fortifications.

The conclusion is, therefore, not to be avoided—and to this I would draw particular attention—that, in order to possess the means of overwhelming an assailant in the manner proposed, and of always remaining superior to him in defensive works, wherever he may appear, greatly increased garrisons must be employed, and the legitimate object of fortification, which is to enable an inferior to defend itself against a superior force, must be almost, if not altogether, abandoned. As long as that legitimate object is to be sought after, the garrison of a fortress must still be contented with something like the more moderate allowance of artillery that it has been found practicable to employ in past times, in due proportion to the size of the works and the numbers of their defenders.

Recent experience does not set aside that of the past in this respect. "What can the man do that cometh after the king?" What can the fortress do, as far as men and guns are concerned, that comes after Sebastopol? It is not every work that can expect to have in combination, a large army for its garrison, an entrenched camp of great natural strength for its fortifications, the contents of an arsenal for its guns and munitions, those of a fleet and a dockyard for its further assistance, and freedom of communication with the open country for its supplies. But with all the men and all the guns that were at their command, and during all the time that they were afforded for their operations, the Russians were only able to muster 1,254 pieces of ordnance altogether on their works, against 814, which the Allies had in position, according to the statement of Marshal Niel, previous to the last assault.

We thus acquire a practical idea of the garrison and resources that would be required for one of Mr. Fergusson's octagon, or 1,000-gun, forts; and here I must point out, before quitting this part of my subject, that, with regard to the question of the number of guns to be employed, Mr. Fergusson has been led into a serious discrepancy. He says, at p. 42 of his *Essay*, under the head of Armament, "The only essential point that now remains to be considered is the armament. The number of guns usually considered requisite for an octagon of the dimensions I have adopted, is 150. (*Aide Mémoire*, vol. i. p. 52.) This, in fact, is only fit to be an *armement de sûreté*, or a defensive element, without any offensive power, and I would, therefore, propose a similar one for my *fausse braye*, or defensive work. As this, therefore, is never considered in estimating the expense of a front of fortification, it may be left out on both sides; but, as the *offensive* armament I am about to propose does not exist in the usual systems of fortifications, it may fairly be charged as an additional expense inherent in mine." And he thus estimates his armament for an octagon on the French system, for what has been called a second-class fortress, about two miles only in circumference. "In looking at the plan, Plate II., it will be seen that the four rear ramparts measure about 26,000 feet in aggregate length, so that, allowing twenty feet to each gun, from centre to centre, there is room on them for 1,300 guns. As this, however, is more than will be required, suppose we adopt 1,000 as the maximum. Not to complicate the matter, suppose one-fourth of these were 8-inch shell guns

of 65 cwts., one-fourth 32-pounders of 56 cwts., and the remaining half equally divided into 24-pounders of 50 cwts. and 20 cwts. respectively; the average weight of these guns would be under 50 cwts. ($47\frac{1}{2}$ cwts.) which, at 15*l.* per ton, would cost 37,500*l.*, and with 1000 carriages, at 10*l.* each, would make up, say 48,000*l.*, or 6,000*l.* per front. This, of course, is an immense charge for artillery, but, if by spending 6,000*l.* in this manner you can save 60,000*l.* in masonry, no one will deny that the plan is an economical one."

But in this estimate of artillery, the cost of ammunition, which is by far the most expensive part of it, is altogether omitted, and I observe that, when Colonel Wilford pointed out to Mr. Fergusson, in the course of the discussion which ensued on the paper to which I am immediately replying, that each gun with its ammunition would cost about 1,000*l.*, Mr. Fergusson replied, "Now the fact is, that a fortress of the ordinary construction, on the bastion system, has a great number of guns, nearly as many as I would ask for, and every gun must have ten men, and so on. Give me the same number of guns as are put into an octagon of the ordinary construction, and I am content."

This estimate of the expense of the artillery given by Colonel Wilford, would, in fact, increase the cost of Mr. Fergusson's artillery from 48,000*l.* to 1,000,000*l.* as a maximum offensive armament for a fortress constructed on a radius of about three-quarters of a mile. Mr. Fergusson has, no doubt, taken this as an excessive armament; but I am compelled to refer to what he says on these points, because throughout his published works he puts forward enormous armaments as the principal element of strength in his system.

For instance, he says, at page 61 of his *Essay*,—"In the first place, it is requisite to subdue and annihilate the 1,000 guns of the upper, or offensive fort; this, as I showed before, is not an easy, if it be a practicable, operation; but till it is done the besieger can neither advance in safety to the edge of the ditch, nor attempt to establish his batteries there, and till this is done he can proceed no further; for until the revêtement is breached the fort must be considered impregnable; and situated, as it is, 20 to 30 feet below the level of the country, it cannot be touched except from the counterscarp." In this case he has 1,000 guns on his upper ramparts, in addition to those employed below as a defensive armament; and he proceeds, "Arrived here, however, the besieger must first turn his attention to the guns of the fausse braye, which are equal in number to those he can bring against them, and are intact, as he has not yet seen them." Again, at pp. 62 and 63, *Essay*, he says, ".Supposing the besieger establishes 100 mortars behind his first parallel, there is nothing to prevent the fort having an equal or double number to reply to them. For this purpose it is only necessary to withdraw 100, 200, or 300 guns from the armament previously proposed, and replace them with mortars; and, as it is absurd to suppose that 1,000 guns, or anything near that number, can ever be brought into the field, this can be done without at all diminishing the relative superiority which it is necessary the fort should have."

In speaking of the strength of such works, in reference to the lines he proposes for the defence of Portsmouth, he says also, at p. 43, *Peril of Portsmouth*:—"So that if the fort could only reply with the same number of

guns it must obtain the victory. But it can always command twice, or thrice, or four times the number, so that battering by artillery will not avail."

But Mr. Fergusson stated, in reply to the discussion on his paper of last year, "What I complain of in the bastion system is, that the guns are some to the right and some to the left, and some north, and some east, and some west, but not looking towards the enemy. Now all I want is, that every gun shall point to the enemy. If that is done, it is all I contend for; and what I pretend to do in this mode of facing the enemy by curved lines or any others, is simply that the guns, instead of being left and right, and being enfiladed, shall face the enemy, and shall not be enfiladed."

Now, it will be observed, that what Mr. Fergusson does is this: he first proposes to take the whole 150 guns that are considered sufficient in practice, in the case of a French fortress, for his defensive armament, or "armement de sûreté," and, hiding all these in his flanks, or in his fausse braie, to employ 1,000 guns, or guns and mortars, in addition to them, for offensive purposes. And, while exhibiting the strength of his system, he displays the full advantage of the superiority which he thus commands in guns or mortars, or both, to any weapons that the besieger can bring against him. But he afterwards, to avoid the great expense of this arrangement, drops the extra offensive armament of 1,000 guns and mortars altogether; he takes the 150 guns of a French fortress only; he places them all fronting towards the enemy; he has none left for fausse braie or flanks; he leaves his work without flank defence; and yet he remains to all appearance as strong as before.

It is absolutely necessary in every fortified work that some guns should look to the right, and some to the left, and it is desirable to have also as powerful a fire to the front as is practicable; and we should have, in fact, in Mr. Fergusson's systems, more guns looking to the right and left than in the French system, if he were to absorb the whole armament of a French system to act as his defensive armament only, and to employ the extra number referred to for offensive purposes. In fact, he shows as many as 80 embrasures, in the plan that is published with his *Essay*, in one bastion only, which would, if they were occupied, at once absorb the half of his defensive armament. But it is impossible, if he omits this enormous offensive armament, that he can retain his strength, or can act upon the main principles that he has put forward; and I may add, that his ramparts without his extra guns would not stand him in much stead, any more than his guns without extra ammunition, or his ramparts, guns, and ammunition, without a very largely increased garrison.

There is one circumstance, however, which will no doubt occur to many who are present, and to which it will be desirable to allude, in reference to the effect that will be produced on the attack and defence in this respect by the introduction into use of lighter, breach-loading cannon. In future, a greater number of guns will be capable of being served by the same number of men, because each gun will be more easily transported from place to place, and will require fewer hands to work it. This fact did not enter into the calculations of Mr. Fergusson, or into those of Montalembert, of course, because they put forward and advocated the principle in question, together with their systems of fortification for carrying it out, before there appeared to be any likelihood of weapons of this description

being employed. But it would certainly favour their views to some extent, if it were not for other circumstances which must also be taken into consideration. These are :—1. That vastly increased areas will have to be inclosed, and fortifications of far greater extent to be constructed. 2. That their garrisons will have still more work to do, and greater spaces to defend ; and that, therefore, a smaller proportion of them than before will be available for artillery duties at particular points. 3. That the light guns of the besieger will be able to cope with the heavier guns of the besieged. 4. That the besieger will be able to bring a greater force of artillery to bear, and that it will therefore be still more difficult for the garrison to overwhelm him. The besieger will, in fact, only require heavy guns in future for purposes of destruction. For opposing the artillery of the garrison, his light guns, which will have equal range and accuracy, and which he will be able to employ with greater facility, will, in most cases, be far more useful to him.

It does not, therefore, on the whole, appear likely, in any case where the proportions of men upon which it is fair and reasonable to calculate, are engaged in the attack and defence, that it will be more possible in future, than it has been found to be in past times, for a garrison to overwhelm, or permanently to check, its assailants by means of a superior force of artillery. If they could always command a supremacy of that arm at any point on which they might be attacked, it would be, no doubt, as I have said before, a great advantage to them; but it would neither, as I shall show presently, stop the progress of the besieger, nor is it, when taken alone, that which would delay him most effectually in his approaches to a fortress.

As the garrison must thus in some degree be limited in its offensive powers, and as it can only make use of a given quantity of artillery in proportion to its own numbers, the next point to be discussed is, whether it will be practicable or desirable to employ several tiers of earthen parapets one above the other, on which to mount the guns which it *does* possess or can be advantageously provided with. With reference to this point I may quote a remark from M. Mangin's "Memoire sur la fortification polygonale," which has been thus translated by Sir Howard Douglas :—"In fact, on the rampart of an enceinte having the form of a simple polygon, it may be possible to place 390 pieces of artillery in opposition to the besieger's batteries ; while, on a bastioned enceinte having the same number of fronts, only 260 pieces could be placed to answer the same purpose. This last number of pieces is, however, greater than it has been found possible to employ in any fortress hitherto besieged." And there follows upon this a further remark, which has especial reference to what I have previously said :—"The number of men required to serve this quantity of artillery is far greater than it has been found possible to maintain or employ in any fortress hitherto besieged ; and the amount of labour in executing and keeping in repair so many embrasures, platforms, and traverses, would exceed the powers of any garrison which it would be prudent to leave in a place. The reasoning of Montalembert is, therefore, without force, practically speaking : it may be observed also, that the besieger has greater facilities than the defender for extending his operations ; and he has the advantage of being able to occupy with his artillery positions which permit

him to employ that convergency of fire, in which the superiority of the attack to the defence in a great measure consists." Again (p. 138), "Mais les anciens fronts fournissent déjà, pour les feux directs, plus d'emplacement que n'en peut occuper l'artillerie d'une place assiégeée." M. Mangin is arguing in favour of the bastioned, and against the polygonal, or German system; and his argument is this:—There is no advantage to the polygonal system in consequence of its enabling its defenders to employ 390, instead of 260, pieces of ordnance on the ramparts of a fortress in opposition to the batteries of the attack, because it has not been found practicable to employ even the latter number in any fortress hitherto besieged. If this be the case, how much less necessary must it be to incur the expense of constructing the extra tiers of ramparts proposed by Mr. Fergusson.

For the active artillery operations of the defence, there is required, not only the most powerful fire that can be practically obtained, but also that which it is most difficult to silence. The guns and gunners must, if they are to act at the greatest advantage, be protected in the best manner; and the garrison must be in a position to use their weapons most effectively against their assailants; and I will add, though I do not wish to uphold the French system, that for this purpose the cross fire which is afforded by the bastioned outline is not to be despised, and is in some respects of more avail than direct fire; just as a convergent is in all cases more to be dreaded than a divergent fire. The number of guns in the possession of the garrison being in practice necessarily limited, as well as the number of men, they should evidently be together husbanded to the utmost, and be placed in positions where they can do the most mischief with the least risk. Loss of men and guns, extra labour and inconvenience in repairs and renewals, loss of time in remounting guns and replacing carriages, and other contingencies, can only be guarded against in this manner. For these reasons a small number of guns securely placed in good casemates, will be of greater avail than a greater number exposed upon open ramparts. In proof of this I will read to you a remark made by Sir Harry Jones in his official account of the operations before Sebastopol. Sir Harry says:— "The great facilities afforded by the indentation of the lines of defence, enabled the garrison to multiply *ad libitum* the flanking fire of artillery; there were some guns so admirably placed that they could not be silenced, and caused great annoyance and loss up to the last moment of the siege."

Mr. Fergusson professed himself in favour of casemates in his *Essay*, and he proposed to adopt Haxo casemates extensively; but in the *Peril of Portsmouth*, p. 45, he says, "In smaller and more confined works it might be necessary to obviate part of the inconvenience experienced from vertical fire, by covering a certain number of the guns with casemates, not of course with masonry fronts, but Haxo casemates, in which the earthen parapet and embrasure remain the same as on an open rampart, a vault only being thrown over the gun. When, however, such an extent of rampart can be obtained as is here available, this would be a useless precaution, and it would be cheaper to allow four or five guns to be destroyed than to erect one vault; besides, the advantages of light and air are so great, that I question if casemates would not be more prejudicial to the defence than otherwise."

This was, however, written before the introduction of rifled guns, and he will now probably be disposed to change his mind in this respect. It is pretty clear that in future gun-casemates will have to be very extensively adopted, and I may demonstrate the occasion for them in a very few words.

It must be remembered that a fortress is a stationary object, and that the besiegers can adopt any measures they think proper against it pretty much at their leisure. They can ascertain their ranges with great precision before opening fire, and employ their weapons with all the accuracy of which they are capable. They may plant rifled artillery here and there in convenient situations, at 1,000 or 2,000 yards from the ramparts, and they may from time to time, as they think proper, discharge such missiles as Sir William Armstrong's celebrated *case-shells*, at high angles, in a curved trajectory, and direct them upon any portion of the ramparts they may wish to attack. The missiles from the interior of these casemates, dropping in over the tops of the parapets, would harass the garrison very much, in many cases, even before the parapets were injured, and in some cases would make it impossible to serve the guns. They may also place sharpshooters in suitable positions at half a mile from the ramparts, and usefully employ them to produce similar effects, the curved trajectory on which the bullets travel at long ranges being ample for the purpose.

It is quite true that the garrison may annoy the besiegers in the same manner, by the fire of guns and rifles directed on their trenches and batteries, and that this effect will inevitably lead to the employment of blindages, and of underground work, on the part of the besiegers, to an extent which has not hitherto been found necessary.

But that will not better the position of a garrison having open ramparts to defend, and I think it will be evident to all upon consideration, that those guns which are securely posted, not only behind good ramparts but also under good roofs, well covered with earth, will do the best work, and will be found most annoying to the assailants in future sieges.

These gun-casemates are, however, expensive to construct. It would hardly be practicable to entertain the idea of employing them, except at intervals, along even one long line of ramparts; and it would certainly be out of the question to think of supplying them on three, four, or five tiers of ramparts, if so many could in practice be provided.

I will next proceed to investigate the cost of constructing the earthwork of these ramparts without casemates, and to show how very erroneous are the estimates which Mr. Fergusson has given.

Next to his great point of superiority of artillery fire is that of economy. He believes that he would obtain an inexpensive system of fortification by the employment of great numbers of guns upon enormous masses of earthen ramparts; and he strongly protests against the use of masonry on account of its expense, and argues in favour of the employment of earthwork on account of its cheapness.

The price which he puts down for brickwork and masonry, promiscuously, is 20s. a cubic yard, and earthwork, he estimates with some trouble, taking his data from canal work in this country, and from the works of foreign writers, at 3d. per cubic yard for ordinary systems, and 6d. per cubic yard for his own system. He thus makes masonry to cost 80 times

as much as earthwork for other systems, and 40 times as much for his system.

The average prices that have been contracted for by competition, and that are being at present paid in this country for works of fortification, are, as I have taken pains to ascertain from the best authority, 9*l.* a rod, or 17*s.* 10*½d.* per cubic yard, for brickwork; 12*s.* 6*d.* a cubic yard for masonry; and 2*s.* 6*d.* a cubic yard for earthwork, including excavating, removing, forming, ramming, &c. The average cost of brickwork and masonry, therefore, would be 14*s.* 8*d.* (say 15*s.*) for the two, both being called for brevity masonry.

It thus appears that, instead of the masonry costing 80 times, it only in fact costs six times as much, for equal quantities, as the earthwork, so that the expense of six cubic yards of earthwork is equal to that of one cubic yard of masonry; and, allowing the same rate for Mr. Fergusson's ramparts as for those which are now being executed in this country, it is clear that they would cost, without adding anything for the increased *lift* that they would require in all cases, just five times as much, for earthwork alone, as the price at which he estimates them.

This very serious difference in figures upsets the whole of Mr. Fergusson's calculations. It shows that Montalembert had the truth on his side when, looking relatively to the quantities of earth and masonry that he would require, he preferred masonry to earthwork, as far as expense was concerned, rather than Mr. Fergusson when he prefers earthwork to masonry. It proves, that if^o Mr. Fergusson's estimate be correct, according to the prices he has assumed, his Gosport lines, instead of costing 100,000*l.* would in fact cost half a million of money for earthwork alone, a sum for which they may be completely defended, and supplied, including the purchase of the land, with fortifications, bomb-proof barracks, and every requisite, when other methods are employed.

The economical construction, then, which Mr. Fergusson holds forth as one of the chief advantages to be obtained by the system that he proposes, does not really exist; but, on the contrary, if the system which he advocates were desirable or practicable in other respects, the extra expense which it entails would go far to prevent it from being ever carried into execution, or so many tiers of ramparts from being made. In comparing its expense with that of other systems, Mr. Fergusson is in the habit of considering these latter together with their outworks, such as the tenaille, ravelin, &c. as against his own system without outworks; and, independently of the error in his prices, this course is hardly a fair one. It will give a more accurate notion of the expense of his system to compare it with that of the fortifications constructed at Paris. The enceinte which has been constructed round that city is about 20 miles long, comprising upwards of 90 bastion fronts of 300 or 400 yards each in length. Each front has been estimated on an average at 800,000 francs, or 32,000*l.*, and the complete enceinte to have cost about 3,250,000*l.* This does not include, of course, the whole of the works, because there are in addition the interior defences, the advanced forts, the armament, &c., all to be taken into account; and the cost of all of them together has been stated by one author at 8,000,000*l.* sterling; but it refers to the portion to which Mr. Fergusson's system would be affixed.

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Mr. Fergusson gives us now a very simple idea of his system, by saying that it is merely so many tiers of ramparts added on the top of a French or a Prussian system. In order to convert the fortifications of Paris, therefore, into a fortification on Mr. Fergusson's system, several extra tiers of ramparts would have to be placed behind the present ones, and the ditch, which is now 22 feet deep, would have to be made 40 feet deeper, and as much broader as would be necessary for obtaining the extra quantity of earth required to form the ramparts. Instead of cheapening the fortifications of Paris, this arrangement would clearly add to their cost just the amount which would be required to give the extra depth for the ditch and the extra mass for the ramparts that Mr. Fergusson considered to be desirable.

If 600 square yards of section were thus added over a length of 18 miles of ramparts, upwards of two and one-third millions sterling extra would be required, at English prices for ordinary ramparts, to be expended on earthwork alone.

This amount might be reduced at French prices, but would be increased by the extra height to which the earth would have to be lifted; it would be still further increased if a proportion of casemates were employed on each rampart; and it would be very much increased by any provisions that were made for roads along the ramparts, for ramps, bomb-proof communications from one rampart to another, traverses, platforms, magazines, and embrasures. I shall, at all events, be giving a very moderate estimate, in stating roughly that the cost of the enceinte would have been more than doubled, if the system which Mr. Fergusson has advocated had been employed in the construction of the works.

As a contrast to this I may quote Mr. Fergusson's calculation of the total expense of his system, compared with others, at page 60 of his "*Essay*": "Such revetments therefore as I have been proposing ought not in ordinary circumstances to cost more than 20,000*l.* per front, an additional expense arising entirely from the absence of wet ditches without any corresponding advantage. If we add these sums to those found at page 40, it will appear that a complete form of fortification should never cost more than from 30,000*l.* ($10,000 + 20,000$) to 45,000*l.* ($15,000 + 30,000l.$) per front, which is about half the usual expense according to other systems."

But if these multiplied tiers of ramparts could not be practically employed in past times, in the fortresses that were then in use, how much less can they be made use of in future? Mr. Fergusson says truly that a radius of 5 miles, taken as the range of modern guns, represents a circumference of 30 miles, for the size of a fortress in which immunity from the effects of shot and shell is to be provided; and there can be no doubt that the fortifications of the future must be extended over far larger areas than it has hitherto been found necessary to occupy.

I have already given an idea of the expense of applying these tiers of ramparts and these deep ditches to a large circumference, by showing how largely the cost of the enceinte of Paris would be increased, if its ditch were deepened, and if several tiers of ramparts were added to those which it has at present; and I would now ask you to consider for a moment the question of manning and arming works of this description. In the first place, a minimum defensive armament of upwards of 1,000 guns is required for the security

of a position covering this extent of ground, and an army always on duty to render it safe against assault. Then, again, considerable forces must be securely lodged at intervals along its whole length, in order that the enemy may be vigorously opposed, and may find a strong force before him in a proper state of preparation wherever he may make an attack. The size of the garrisons and the magnitude of the resources thus demanded, the necessity for having posts of security at intervals along lines of this extent, and considerations of economy in their occupation, all point to the conclusion that it will be desirable to fortify them by means of detached forts, rather than by continuous lines; and it will be thus seen, that, instead of the tendency being to multiply lines of ramparts in future works, it will be, on the contrary, to employ single lines of ramparts at intervals; and there can be no doubt that abundant occupation will be afforded in these latter to any garrison that can be permanently allotted for their defence. Such detached forts are already springing up in this country, and an important question with regard to them is as to the best mode of connecting them together, when such connection is required, so as to prevent an enemy from passing between them. With regard to this point, I may observe, that I do not know of any better method than by placing a self-defensible, continuous, counterscarp (or sunken wall with its back to the enemy) at a convenient distance in front of them. This would afford a sufficient *obstacle* for security against sudden attack, would be indestructible by the besieger, except by mining operations, would afford good covered communication from one end of a line to the other, and would be the cheapest continuous obstacle that could be provided in proportion to its efficiency. It would also afford protection to any temporary works thrown up behind it, when the defenders of the position could be increased in numbers, and when such works could be profitably employed in addition to the permanent ones.

I may now leave the questions of quantities of artillery and tiers of ramparts, to proceed to the consideration of the construction and the passage of Mr. Fergusson's very large ditches.

These ditches are a strong point with him; and the wet ditches particularly so. He considers, however, that neither the wet nor the dry ditches can be passed by the besieger under any circumstances.

In his application of wet ditches Mr. Fergusson follows the example of the earlier Dutch engineers, who were in the habit, down to the seventeenth century, and to the time of Coehorn, of constructing their fortresses of simple mounds of earth, disposed in suitable forms, and surrounded, as they could be so conveniently, with the water which filled up their ditches. These fortresses, we are told, at first made defences of great obstinacy, particularly in the War of Independence; and they were therefore generally approved until they were attacked by Louis XIV. They were then reduced (particularly in the year 1672) one after another, without great difficulty; and the Dutch found to their cost that they could not place the same dependence on them for the future.

The Baron de Coehorn was therefore selected to improve these Dutch fortresses, and he has earned a great name for himself by the way in which he performed the task. He found out that there was an element of weakness in wet ditches when they were used alone, and without revetments;

and one of the greatest improvements that he is said to have effected was the combination which he introduced of wet and dry ditches.

Mr. Fergusson, however, returns to the practice of the early Dutch engineers, and prefers wet ditches without revetments as the best obstacles that he can interpose between his ramparts and their besiegers; and in considering this part of his system, I cannot do better than take the example which he has given us as being the "one by which its merits may be best tested," (p. 37, "*Peril of Portsmouth*,") namely, the lines by which he proposes to defend Portsmouth on the Gosport side.

These lines are three miles long. They consist of a ditch of that length, (p. 38, "*Peril of Portsmouth*,") nowhere less than 200 feet wide, or having less than 15 feet of water; and there are behind this ditch fausse-braie, and three other tiers of ramparts, forming a mass of earthwork 400 feet wide and 48 feet high. The lowest of these ramparts is bent forward into the form of a bastionet at every 600 yards, in order to afford flank defence. Mr. Fergusson considers that it would be a needless waste of means to bend forward more than one line, as the real defence must always depend upon direct fire, which would be abundantly supplied by the ramparts in rear; and he observes that an additional rampart could be added to these if necessary, and should be in smaller works, as he has shown in his *Essay*. There is a covered way beyond the ditch, sunk to a depth of 10 or 15 feet below the surface, and in a curvilinear form, to secure it from enfilade, though I may observe, that it could not be so deep if the water was as high as it is shown to be in Mr. Fergusson's profile, because it would in that case be inundated with water from the ditch behind it.

This is the simple outline of the work, and Mr. Fergusson states his mode of defence in principle to be this. There are 12 miles of ramparts, and 3,000 guns could be mounted on them, while the enemy could only place 800 in one long line against them; though in practice he believes, that, besides 100 guns and 1,000 men in his bastionets, 3,000 men and from 150 to 250 guns would be sufficient to hold such ramparts "against any army or any artillery that was ever brought into the field." (P. 42, "*Peril of Portsmouth*.)

Mr. Fergusson discusses the different modes of attack that might be directed against this line of works with a better appreciation of the capabilities of the defenders than of the resources of the assailants, and he allows considerable latitude to the former in doing so. Out of these 150 or 250 guns they are always (p. 43) to have twice, thrice, or four times the number that the enemy can bring against them at any point. They are to be ready to oppose him, if necessary, with 200 guns and 100 mortars (p. 45); and the besieger (*idem*) is to find anywhere "in front of him 100 or 200 guns, securely ensconced between earthen parapets, and ready to open on him at a moment's warning." But I will read the whole of Mr. Fergusson's climax as to the impossibility of passing this ditch. (P. 45, "*Peril of Portsmouth*.") "Perhaps an officer unaccustomed to this mode of defence will realize it better if he will fancy himself ensconced with his troops in Kensington Palace and ordered to march across the Serpentine towards London. Even supposing there are no defenders or guns on the opposite side, it is no easy matter to get troops with their arms, ammunition, and clothes across a deep piece of water 200 or 300 feet wide. He must have boats, pontoons, or be allowed to build a bridge. When it comes to this he must fancy the bridges at either end

converted into batteries of 10 guns each, sweeping the whole with a heavy cross fire; and in front of him 100 or 200 guns, securely ensconced behind earthen parapets, and ready to open on him at a moment's warning. What would he do then? Let some one explain the next manœuvre, for I cannot!"

I cannot of course admit that 3,000 men, of whom 1,000 only could be on duty at one time, and who, by the bye, are to be dispersed (p. 44, "*Peril of Portsmouth,*") over 350 acres of surface (eight men and a half to the acre), when the enemy tries to shell them, can possibly defend these ramparts in the way suggested. It would take a far larger number to perform the different duties that would be required of them if the ramparts were fully armed, and if everything were kept in readiness; but it would be out of the question with 1,000 men to move about over these lines with a couple of hundred guns, and perhaps 100 mortars also, cutting embrasures, laying platforms, and making all the necessary preparations, at any required point, according as an enemy directed his attacks.

Against such lines, so manned, armed, and defended, a besieger would have less difficulty than usual in advancing by trenchwork, because a garrison of this size would have more to do than they could possibly accomplish, and there would be fewer men than usual to spare for opposing him; but this is not the main point to which I would direct your attention, because it is not that on which Mr. Fergusson places most reliance. He does not himself attach so much importance to the advance of the trenches; but he is confident that the besiegers, even when they reached the edge of his ditch, would find it utterly impossible to pass it, on account of the quantity of direct artillery fire that he would concentrate upon them, and of the difficulty of crossing water so wide and so deep by any known means under such an accumulation of fire.

I will not attempt to enter here into any details regarding the various methods which have been employed for crossing wet ditches, but I will point out the weakness of this particular ditch, and the way in which it may be dealt with.

It so happens that the average elevation of the ground on which these lines are to be constructed is upwards of 30 feet above low-water mark, and that the bottom of Mr. Fergusson's ditch, which is twenty feet below the surface of the ground, is consequently more than 10 feet above low water. Mr. Fergusson does not say how he would fill this ditch with water, or how he would retain the water in it; but our gallant Allies, if they were to encounter it in the course of any little incursion that they might be making in force in the neighbourhood, would speedily show him how it could be emptied. They have a special and appropriate term for the operation that would apply in this instance, which goes by the name of "*saignée.*" They would either make openings into it from any porous soil that might be conveniently situated in its neighbourhood, or else they would make a canal and allow the water to run out into the sea. Either of these operations being performed—and they would not be difficult of execution—the force of gravity would do the rest. The water would disappear, and the ditch would be at the service of the besiegers. None of the guns of the defenders could see into it except those in the bastionets; and they could not be worked if the besiegers took the precaution to enfilade them at the proper moment from the crest of the glacis or from a greater distance.

But Mr. Fergusson has a novel and very erroneous idea as to the best mode of defending this ditch. He says (at p. 46, "*Peril of Portsmouth*"), "The use of these projections (the bastionets) is to defend the place before the regular attack is organised; once that is done, it would be perhaps as well to withdraw the guns and arm the fausse-braie with them, and trust to the more effectual direct fire for defence." I will add one word upon this subject, because it trenches upon a question of main principle of great importance. We have only to look for the result of such a proceeding in order to perceive the mistake that he has made.

The bastionets employed by Mr. Fergusson are, as I have before explained, 600 yards apart, and are calculated for 20 guns, 10 firing in one direction and 10 in the other along his ditch, though he only places 10 guns in each of them. But this latter number of guns would afford a sufficient flanking fire for the security of the ditch, provided their fire could not be silenced. So long as the water remained in the ditch, and so long as these guns could play over its surface, the passage of it would be an exceedingly difficult operation after the besieger arrived at the edge of the ditch, without any direct fire being employed in its defence. But if these guns are removed from the bastionets, or are liable to be silenced, as at present, by the besiegers looking down upon their terrepleins, the ditch becomes at once a less formidable obstacle. The 100 guns from the bastionets would be almost lost in a fausse-braie three miles long. There would be only one in every 50 yards, and they would be almost useless in this position, instead of affording a powerful flanking fire, as they would if they were properly protected in the bastionets. But more than this, when these guns are in the fausse braie, even supposing that they were all collected into one front, or one space between two bastionets, and that all the ramparts to the rear were fully occupied with guns, then not one of all these guns could see the bottom of the ditch when it was dry, and they could not any of them defend that part of the ditch which lies close under the parapets, and between the embrasures, even when the ditch was full of water. The removal of these guns from the bastionets would deprive the ditch of the most economical and most effectual defence which it could have; and this defence would be most required just at the time when Mr. Fergusson proposes to take them away—namely, when the besieger has approached towards the edge of the ditch, and is in the best position for taking his measures for crossing it.

For these reasons it will be evident, that Mr. Fergusson's proposal for securing his ditch by means of the direct fire that he considers to be most effectual for the purpose, is founded on a wrong principle, and that flank defence, at all times required, is most wanted when he would dispense with it.

But when the water has been drawn off from the ditch, in the manner above referred to, there remains what is tantamount to a breach three miles long in his works, and this flanking fire would be the only means by which it could be defended, if the guns were properly protected. As I have shown, however, they could be easily silenced, either by enfilade or vertical fire, if they were placed, as Mr. Fergusson proposes, on open bastionets.

I will not go into the question as to how the ditch should be passed if the flanks or bastionets were retained for use, and if they were properly

protected from the fire of the besiegers, because that is a question which appertains to the ordinary principles of fortification. I think I have demonstrated, that the wet ditch by which Mr. Fergusson desires that his system should be judged, is not so difficult to cross as he believes it to be, or as it may appear to be at first sight, and that it ought not to be defended in the way in which he would defend it; and I am glad to bring forward this, also, as a good illustration of the difficulties that are connected with the employment of wet ditches without masonry revetments. Mr. Fergusson has in his works laid great stress upon wet ditches as a means of defence; and in his Lecture of last year he stated that they were by "far the best" ditches that could be employed (p. 6), and that they must now be "far wider and deeper than any yet executed." I would, therefore, say a word or two further on the subject of them in this place.

When of moderate dimensions, they are undoubtedly the cheapest obstacle, in particular situations, that the engineer can employ for the defence of his works; but they can seldom be conveniently made use of so as to be very effective; and they are always, in some respects, disadvantageous to the garrison. A dry ditch facilitates the communications of the garrison, and is at the same time an obstacle to its enemies. A wet ditch is an obstacle to both. When very broad it is still more so, and when both very broad and very deep it loses its advantage of cheapness altogether. Besides this, it impedes the action of an obstinate defence, prevents the commander of a garrison from employing his men so safely, or so conveniently, in advanced rifle pits, or in any temporary works thrown up in advance of the place, and renders any sentries or parties retained on the further side of the ditch more liable to be cut off in the dark. It is well known that the best form of ditch is that which can be made wet or dry at pleasure,—that can be constructed and employed in all respects as a dry ditch, with revetments and good flank defences, and that can be inundated at pleasure by the garrison, when circumstances render such a proceeding necessary. But when a ditch has to be filled with water from sources that can be diverted or destroyed, when the water contained in it can be drained away, or drawn off through another channel, or when the *batardeaux* which keep it up to its proper level can be ruined, then it only imparts to the garrison that trust in it a false feeling of security. I may add, however, that the arguments which I have used, though fatal to the employment of the long wet ditch proposed for these lines by Mr. Fergusson, would not apply in the same way to the case of small wet ditches surrounding detached forts on the same lines. The long ditch obstructs the communications of the whole line: the short ditches would not interfere with them. The long ditch might be drained by one operation: the others would require several operations, one for each ditch; and the advance of the enemy towards them would have to be opposed on small fronts.

The cases are not frequent, however, in which a wet ditch without revetments can be depended upon, in providing against a chance of prolonged siege operations; and it is in most cases desirable that some further means of security should be employed. I believe, myself, that it will not be necessary, or desirable, in the generality of cases, to combine an escarp, or an escarp and a counterscarp together, with a wet ditch, which has been

hitherto supposed to be the alternative, but that it will be more advantageous to use a hollow counterscarp only, on the further side of it,—as an additional security against assault; as a safe retreat from the front, and a secure footing beyond it for the garrison; and as an obstacle which cannot be destroyed by the fire of the enemy.

I would next point out in a few words, as I have promised to do, how that the enormous dry ditch proposed to be used by Mr. Fergusson, is in reality not so formidable as he would have us to suppose. I have shown already that he could never in practice possess or employ anything like the vast means to which he refers in his works. But I would now add, that even if he had a superior force of artillery, which could not be silenced, upon works of this description, and even if the besieger, arriving with his trenches to within 80 or 100 yards of the place, could not proceed further, or, rather, if he could not, which is the position which Mr. Fergusson takes up, establish a battery upon the edge of the ditch,—there would still be no very serious difficulty in the way of his breaching the escarp, and forcing an entrance into the works.

The prescribed course, in all cases of this description, is to make what is called a descent into the ditch, which merely means an underground gallery, constructed at a proper slope, leading from the surface of the ground to the bottom of the ditch. Of course, the deeper the ditch, the longer must be the gallery, in order to maintain the requisite inclination in the descent. Any number of galleries may be constructed in the same time as one gallery; and I need hardly add that the miners in the gallery are safe from the fire of the place. A great gallery, as it is called, may be constructed in average soil at the rate of about a foot per hour, or, say, in ten or twelve days for 80 yards; and, at the end of that time, the besieger is at the bottom of Mr. Fergusson's ditch. Once there, he can enlarge the openings leading into the ditch, place guns in the galleries in positions of security, and destroy the masonry revetments, both of the curtains and the flanks, at his leisure. In fact, the revetments would be entirely at his mercy, and not a single gun out of any number that there might be on the ramparts above, would be able to interfere with him. I need not follow the besieger further, as I have shown how that might be accomplished without difficulty which Mr. Fergusson has put forward as an impossibility; but I will state that there is even a precedent for this course in the operations of Vauban. When this engineer employed a miner against the escarp of the fortresses which he attacked, as he was in the habit of doing, before the operation of breaching by batteries placed on the edge of the counterscarp came into use,—he first made an opening in the escarp for the reception of his miner, by means of a gun brought down into the gallery for the purpose.

A good system of countermines, properly defended, will, however, delay the besieger in passing the last 80 yards before he comes to the ditch, more effectually than all the guns that can be directed against him from the ramparts of a fortress. These latter will not prevent his working underground, but the countermines of the garrison will always prevent him from working above ground, until they have been destroyed. It has been estimated that the besieger would be occupied for forty days, or two months, in approaching the ditch from this distance, if proper steps were taken to prevent him by this means; and I have shown that only ten or twelve days would be necessary

if the miners of the besiegers were unopposed. It will, therefore, be seen, that a defence by countermines would always be far more effectual at this stage of the operations than a defence depending solely upon direct artillery fire; and it may be even said that in cases in which these data could be assumed to be correct, a defence by countermines alone would, setting aside the question of defensive fire, be four times as effectual at this period of a siege as one maintained by the offensive fire of 250, 500, or 1000 guns, if countermines were not employed.

These considerations, and all others with reference to the best and most economical manner in which countermines may be employed, have a very important bearing upon the question of fortifications as they should be constructed in future, because the difficulty of working above ground, under the fire of the accurate long-ranging weapons of the present day, which will be experienced in future siege operations, will certainly lead to the execution of more work underground than has heretofore been attempted.

But I have already detained you for too long a time. I must now collect together the different points which I have brought forward, and bring my remarks to a brief conclusion.

In the first place, I have attempted to prove to you, what I firmly believe myself, that the construction and employment of Mr. Fergusson's system would really be impracticable, for three reasons:—1. The great expense of the tiers of ramparts themselves. 2. The great expense of the armament that would require to be provided for them if they were to be made use of as he suggests. 3. The great numbers of the garrison that would be wanted to man them, who could least be spared in such numbers from the army in the field when they would be most required for their defence. I have shown that the object of fortification, which is to enable an inferior force to resist one considerably superior to it, would be abandoned if the garrison were to be so much increased in numbers, and were thus to be made more nearly if not quite equal to the forces by which they might expect to be attacked; as well as that a garrison so increased would not require such formidable or such expensive works for its defence. I have pointed out that wet ditches cease to be cheap when they are constructed on so grand a scale; that they are not so formidable or so desirable, and that they cannot so frequently be applied with advantage as Mr. Fergusson asserts; as well as that direct fire is not the most effectual method that can be adopted for their defence.

I have demonstrated that the progress of a siege is not so much dependent upon the issue of an artillery conflict as he represents; but that there are also other means of attack to be taken into account,—that the operations of mining in the later stages of a siege are unaffected by it,—that all the means in the power of the besieged should be employed to stop the advance of the besieger at each stage of his operations,—that a garrison must still use "the flanking fires, the mines, the sorties, and the chicane," of which Mr. Fergusson speaks in so disparaging a manner (p. 163, "*Essay*"), instead of trusting too exclusively to the power of direct artillery fire. I have pointed out a simple means by which, even if the Gosport lines were constructed and defended according to the system proposed, this ditch and these works, so impregnable in Mr. Fergusson's eyes, the only practical example he has given us, and that by which the merits of his system may

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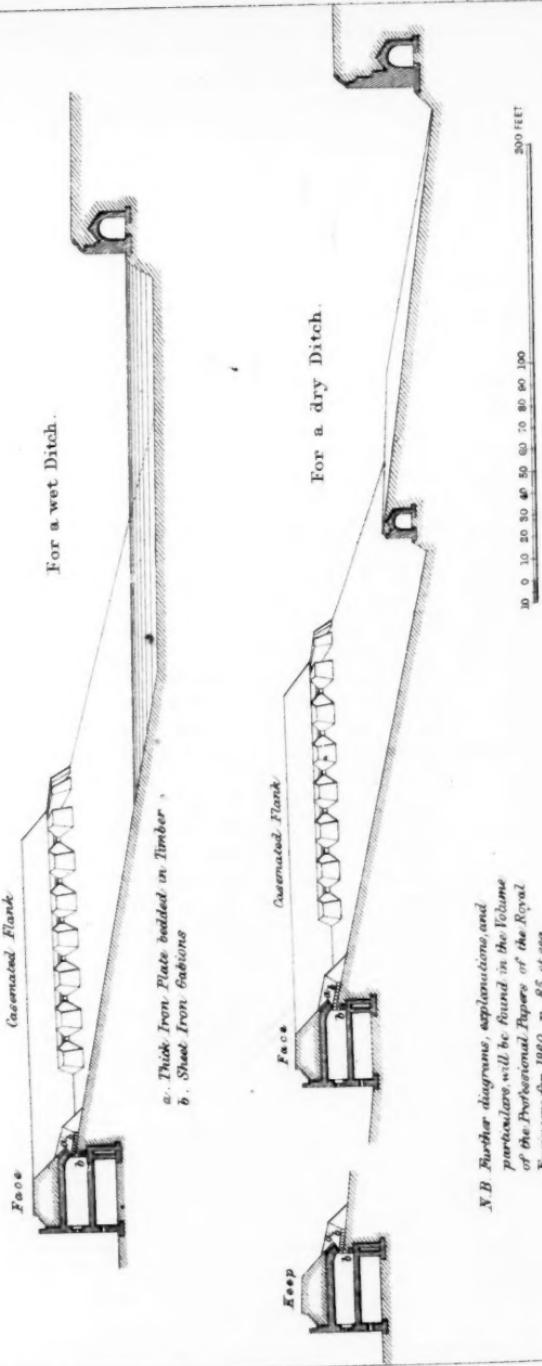
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PROFILES TO ILLUSTRATE PRINCIPLES OF CONSTRUCTION PROPOSED BY CAPTAIN TYLER, R.E.
FOR ADOPTION IN PERMANENT WORKS OF FORTIFICATION.



*N.B. Further diagrams, explanations, and
particulars will be found in the Volume
of the Professional Papers of the Royal
Engineers for 1860, p. 85, et seq.*

be best tested,—would not offer very much more impediment to a besieger than they would to their garrison, and that even the dry ditch, with its walls 30 feet below the ground, could be reached by the batteries of the besieger, from a position where those batteries would not be exposed to the 1,000 guns that Mr. Fergusson would place upon his ramparts. In fine, I claim to have shown that this system is founded upon erroneous principles of defence; that it could not in practice be constructed; that even if it were to be constructed it could not be manned or armed; and that it would not after all be so formidable as it is represented to be.

But as Mr. Fergusson brings this system forward again at a time when vast improvements have taken place in the weapons of war, I am obliged to point out in addition, that it proceeds upon principles and recommends alterations just the opposite to those which appear now to be required. Instead of employing detached walls or escarpments, 30 feet below the surface, and no counterscarps, as shown in Mr. Fergusson's model and his first profiles, I believe that we must now cling more to our counterscarps, and, if anything, abandon our escarpments. Instead of adopting circular, we must adhere more closely to rectilinear forms, as we can by their means obtain more effective flank defence with a given number of guns, and defend a greater length of line from one point. Instead of placing tiers of ramparts upon continuous lines, we must extend our single lines of ramparts, and even break them up into detached forts, with intervals between them. Instead of an increased use of open ramparts, we must have for the permanent parts of our works such casemated ones as are required.

The question of earthworks, as advocated by himself, *versus* masonry, as advocated by his opponents, which Mr. Fergusson puts constantly forward in his lectures and publications, is not the real question at issue. Mr. Fergusson employs masonry also in his dry-ditch works; and the great difference between his system and the French systems in this respect is, that he first sinks his masonry 30 feet below the surface of the ground, and afterwards partly nullifies the advantage, of better protection for the escarp walls, which he expects to obtain from this arrangement, by increasing the width of his ditch. By the manner in which he employs his earthwork, he loses, however, to some extent the advantage of this material over masonry, by elevating it, and exposing his parapets to more easy destruction. It will be desirable, on the contrary, in future, to keep the ramparts and parapets as low as possible, whilst placing them in the most commanding situations.

I think, myself, but that is a new idea, and one which I should be glad to hear discussed, that we may, looking to the tendency of future operations, find it advantageous to dispense with escarpments altogether, even in the case of dry ditches, and to adopt profiles constructed on the principles shown in the accompanying diagram.

They are designed upon the assumption that flat slopes of earth are those which will be the least exposed to destruction from the shells of rifled guns ; that casemates must be very extensively employed both for guns and troops ; that counterscarps will be the cheapest forms of revetment that can be efficiently employed, besides being those which the besieger would have the greatest difficulty in destroying ; that they should be combined with the use of countermines, which will be required in any case in connection with future works, which would enable the garrison to oppose in the best manner

the advance of the enemy's miner towards them, and give them the opportunity of maintaining a prolonged contest with him in any attempt he might make to destroy them.

I will now leave my case in the hands of the meeting. I have not been able, in studying Mr. Fergusson's principles, to find much in which to agree with him, as will have been plainly observed; but I nevertheless feel that he has been of great service to us all. He has pointed out the necessity that exists for fortifying our arsenals and dockyards, and Portsmouth in particular, with a strength of expression, and a felicity of illustration, that has been of great value. He has stimulated us to reflect upon and to discuss the principles of a science which is of high importance, and in which new interest is awakened, by the performances of modern weapons, and by the condition of the political atmosphere, the appearance of which betokens a coming storm of no ordinary magnitude. His works, though full, as I think, of erroneous principles, are still eminently suggestive; and I have myself taken advantage of one remark that he has made in his "*Essay*," in a way which I am happy to acknowledge. He has pointed out that the weak point of a *Hazo* casernate is the brickwork of the arch above it, and has proposed to strengthen this part by additional brickwork. I have suggested, as I think, a more effectual mode of doing so, by placing in front of it, in a slanting position, a slab of thick iron;* and this will, probably, be a good method of forming a parapet of the least destructible character, to oppose to the fire of a besieger in all future works.

I am glad to find that Mr. Fergusson has been wisely employed on a Government Commission for the consideration of the question of national defence, as I think that all opinions should be represented in such a commission; and I am sure that it must have been a source of great gratification to him to meet with such an interesting and valuable opportunity of studying his favourite subject.

MAJOR JERVOIS.—I do not wish to prolong this discussion, but, having been lately associated with Mr. Fergusson on the commission for national defences, of which he was a member, and of which I had the honor to be secretary, I wish to bear my humble testimony, and I think every member of the commission would also bear his testimony, to the value of Mr. Fergusson's presence upon that commission. It is true it was not the business of the commission to consider the details of fortifications; still the suggestions of Mr. Fergusson on this subject generally were I think of great value. I do not mean to say that everybody agreed with them, and I have before expressed my dissent from the principles of Mr. Fergusson's system; at the same time I think it showed wisdom on the part of the Government to enlist his services; and, if the House of Commons and the country at large agree to the proposals which have been made by the commission, I do not hesitate to say that it will in no inconsiderable degree be due to the presence of Mr. Fergusson upon that commission.

Mr. FERGUSSON.—I am very unwilling to rise and say much upon the subject at present, particularly because this discussion—though I hope it

* Vide diagram.

is no longer so—has very much been considered hitherto as a dispute or quarrel between myself and the Royal Engineers.

CAPTAIN TYLER.—No; no.

Mr. FERGUSSON.—That I hope is entirely done away with now; at least, if any feeling of that sort exist it is not on my part. I have lately, as Major Jervois says, been very much mixed up with the Engineers, and I have been met with the utmost courtesy; and I hope this discussion, if it does continue, will not be considered a personal question any longer, but purely a scientific one.

With regard to the remarks of Captain Tyler, the great point I wish to remark upon is that his criticisms principally apply to what I put forward in 1850. The model before you was made in 1849 and 1850, for the Great Exhibition of 1851; and the "Perils of Portsmouth" was published in 1852. Since that time a complete revolution has taken place in artillery, consequently a complete revolution must take place in defence; whatever was good in 1850 cannot be good in 1860; and if that model was a good system of fortification in 1850, it must be a bad one now. Either I must be gifted with the spirit of prophecy, or I must have proposed a scheme so large and strange in 1850, that it would have been a thing to laugh at then. That model was made to resist the only mode of attack which was then known, the firing round shot from guns vertically. The firing shells horizontally was not then known, I believe. Paixhan had talked of it, but it was not used on land. Percussion shells were not known, and Armstrong's guns were not heard of. The whole system of gunnery has been revolutionised. If I was to propose a system now, it would not be that model or the Lines of Portsmouth; it would be entirely a new system, a new project altogether. I do not wish to put forward that model as what I propose now; quite the contrary. I should modify that to an extent that would make it quite a different thing. I believe the details of that are entirely wrong now, and I entirely repudiate them.

But there are the principles on which that system was based; the great principle Captain Tyler has remarked upon is the separation of the offensive part of fortifications from the defensive part. That appeared to me the great improvement that could be made. The defect in the bastion and the German system is that they use the same guns to flank the ditches that they use to defend the fort against distant attacks, and in placing their guns for flanking purposes they allow these guns themselves to be flanked. The great principle was to separate the offensive from the defensive. If I may be allowed to compare great things with small, I believe it may be classed very much with the improvement that Watt made in the steam-engine. When he took the steam-engine in hand he found the cylinder employed both for propelling the piston and condensing the steam, and the consequence was a loss of steam which was enormous. He suggested one vessel to propel the piston up and down and another vessel to condense the steam, and by separating the two operations he made the present steam-engines. The suggestions which I offered, and really the whole principle upon which my system is based, is that it does separate the offensive from the defensive; you place your defensive guns in security as far as possible, make them take no part in offensive operations, but reserve them till the last moment. That I believe is a principle which the Germans are using,

which I believe is used in this country. It is becoming every day more and more the principle of fortification, and I have very little doubt that it will one day become a very important principle in fortification.

That is so far as I know the principal part of my system.

Then Captain Tyler has said something about the superiority of fire. That superiority of fire is now a new question altogether since the invention of the Armstrong and the Whitworth guns. It is a question I am not prepared to go into, because it would require diagrams. For the Whitworth guns that model is inapplicable. I admit that and give it up. To use the Armstrong guns for flanking positions, where they can be flanked, is to throw them away entirely. They are guns that must be placed in face of the enemy, and that can only be done by separating the offensive from the defensive part, and by the adoption of some means by which these guns can be placed to face the enemy, otherwise they are of no use in the fort.

The number of the garrison was also a point upon which Captain Tyler dwelt a great deal. That it is a point on which I think he is mistaken. I think he calculates the number of men from the bastion system, which requires action on the ditch, and a thousand other things, which if I am at all correct in my views are not required here. The garrison are not required in the ditch, the defence being mere artillery. I think there is a miscalculation in that. I do not see how he makes out that 40 men per gun could be required in a fort like that. However, I am entirely mistaken in my principle if he is right. Then with regard to the expense (which he made a great point of also) of earthwork as compared with masonry I can only say that I am extremely astonished. I can only say that I am prepared to take every book that has been published in Germany, France, and England, I am prepared to take the returns of the Belgian commission for the fortifications of the frontier, I am prepared to take the cost of the fortifications of Paris. All these details have been published, and relative proportion of masonry and earthwork for ramparts is as nearly as possible the proportions which I have stated; whether you take the masonry at 15*s.* or 20*s.*, and the earthwork at 2*s.* or 3*s.*, the relative proportion I believe has been published. Works I have had access to are the same; I may also say that I was a good deal at the Crystal Palace, where there was an enormous quantity of earthwork. I have had a good deal to do with contractors, and I know nothing to induce me to change my views, except to a moderate degree, as to the relative proportions of these two classes of work. I may be wrong, but Captain Tyler's view is certainly not the experience I have learned from any thing I have come in contact with of late years.

I do not know that it is worth my occupying your time; the system which is there presented, and the book I published on "The Peril of Portsmouth," I withdraw them. I admit that now a revolution has taken place in artillery they are inapplicable. It is only the principles which can be relied on, and I do not think the principles have been upset by anything that has been said this evening. I do not think the system of counterscarp is a good one; for this reason, that if artillery fire becomes less and less effective, and underground work is more used, a defence by counterscarp appears to me to be of less value, because the counterscarp being once destroyed by mines, it is the close of the defence which is destroyed, and if that is done the whole thing falls. Therefore I think something other than a counter-

scarp defence is necessary if underground work is to be the mode employed. But in the system which I propose I do not at all exclude the use of mines. On the contrary, there is the greatest possible facility for mines, where there is no masonry to stop them. I do not know any instance of a siege where guns have been brought down by a gallery to the ditch, and where they have been used against the untouched revetment as thoroughly flanked, nay, more thoroughly flanked than any bastion system ever was. Because, if you look to my model, you will see there is not a portion of the ditch where the besieged have not the power of bringing from ten to twenty guns to bear upon it. Till the revetment is destroyed I do not see how any guns are to be established at the bottom of the ditch. I am perfectly certain that it has not been done at any siege in modern times, even after the flanks have been destroyed; therefore I do not see, while the flanks have not been destroyed and the revetment is still entire, how it can be done.

If the discussion is to be renewed, I think it ought to be renewed upon a proposal of mine suited to the present state of artillery. If I bring forward any such plan, I shall be most happy to hear what is to be said against it; but a discussion upon a thing that is a matter of antiquity would lead to no useful result.

Sir C. PASLEY.—When I first became acquainted with Mr. Fergusson I was very much pleased with him indeed. I found that he had studied every system of fortification almost that had been heard of, with some few exceptions. Perhaps he forgets Bordwine, Professor of Fortification at Addiscombe, who proposed a circular system in this country. I thought it a very remarkable thing, that a civilian should study fortification so much, and I gave him my opinion upon his works. He felt obliged to me, and I was to have taken his model, and put it into the model room of the Royal Engineer establishment at Chatham; but when he published his "*Peril of Portsmouth*," I thought little of it, considering it addressed to the popular feeling of the day. That introduced him into notice, and when he first appeared in this room to defend his system of fortification, I stated as my opinion that it was very weak indeed, because whatever number of guns he might be able to mount on successive tiers of made earth, on any portion of his circular outline, I could meet by an equal number in the same frontage in sunken batteries, one behind the other, of which the solid earth, that could not be destroyed, would be the groundwork. I would only have merlons with embrasures to oppose his guns by a direct fire, and mortar batteries, half buried in the ground, the platforms of which could not be seen into. I said that the only strength of his system was in the bastionary part, which he reprobated; for my opinion is, in spite of all that has been said either by him or by Captain Tyler, that the bastionary system is the best, and that neither Armstrong guns nor Whitworth guns, nor any guns, will alter the general principle, or do away with the advantages of that system. I shall not attack Mr. Fergusson's system now that he has given it up, and since he is of opinion, that these new inventions will make an entire change in the art of fortification. Although it has been the fashion to run down the bastionary system, I repeat that I consider it the best; that all its defects may be remedied, and that no guns will alter the art of fortification. There must always be straight lines and flanking defences. I do not agree that a high counterscarp revetment is the best protection against an assault. I

think, as there is always an interior line of works, that the principal defences ought to be inside, and not outside of the main ditch.

Mr. FERGUSSON.—I think you said that I ignored Bordwine. If you refer to my works you will find that I mention Bordwine with the greatest possible praise, as being the person whose system I took up first, in the hopes of rendering it perfect, but afterwards I was obliged to abandon it at a certain point.

Sir C. PASLEY.—I beg to retract what I said, then; my memory is not very good.

CAPTAIN TYLER.—Mr. Fergusson began by saying that there had been a quarrel between us about his system of fortification. I can only say, as far as I am concerned, that I have never had any personal feeling against Mr. Fergusson, and that any idea of a quarrel has never entered my mind at all.

With regard to the horizontal shell firing, which Mr. Fergusson puts forward as new for destroying parapets, I may observe that it is by no means so. I have put up here some diagrams taken from Bousmard's work on fortification, in which is shown the method that he proposed for destroying an earthen counter-guard. His proposal was, to blow away the earth by degrees, by means of shells fired horizontally. He gives a number of diagrams, but I have only taken three of them. He works into the parapet in this way by degrees, and the last diagram shows the parapet completely knocked away. That is the method that has been adopted for reducing ramparts of earth as well as parapets. There is thus nothing new in the system of using shells for destroying parapets, although rifled ordnance will in some cases enable parapets to be blown away with greater ease.

The principle of separating the offensive from the defensive, which Mr. Fergusson puts forward as being the main principle of his fortification, is one that the Germans have adopted in all their recent constructions. These are almost entirely flanked by guns placed in the ditches that cannot be used offensively, and they carry out that principle in all its integrity. There is no doubt that it is a very important principle, and one which may come into play very much in future. Whether it will become universal in its application I very much doubt, because we may find out means for making parapets comparatively indestructible, and in that case we should not require to employ it. By applying iron in a slanting direction—but these things must all be tried by experiment—to the vulnerable portions of Haxo casemates, and by using flat slopes of earth instead of escarp, I think we can make our ramparts and parapets almost indestructible, and can employ our defensive fire for offensive purposes also; and if we can use our bomb-proof buildings at the same time for barracks and for casemated batteries, we shall then save expense.

When Mr. Fergusson says that we ought not to discuss this system of his because he repudiates it, I have no desire to say anything further against it. But I would remind him, that last year he brought forward the system again, in consequence of the invention of rifled ordnance; and that the reason he then gave for again bringing it forward was the same that he now advances for wishing to withdraw it, namely, that rifled ordnance had come into play.

Mr. FERGUSSON.—Was coming into play, I said. It was then an experiment; it is now a fact.

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